DOCUMENT RESUME

ED 105 133 95 CE 003 394

AUTHOR	Stone, Robert D.
TITLE	Identification of Occupational Competencies in Services for the Electromechanical Cluster Occupations.
INSTITUTION	Iowa State Dept. of Public Instruction, Des Moines.; Iowa State Univ. of Science and Technology, Ames. Dept. of Industrial Education.
SPONS AGENCY	Office of Education (DHEW), Washington, D.C.
PUB DATE	74
NOTE	78p.
AVAILABLE FROM	State Director, Career Education Division, Department of Public Instruction, Grimes State Office Building, Des Moines, Iowa 50319 (no charge)
EDRS PRICE	MF-$0.76 HC-$4.43 PLUS POSTAGE
DESCRIPTORS	Agribusiness; Appliance Repairing; *Cluster Analysis; Electrical Appliances; *Electromechanical Technology; Employment Qualifications; Equipment Maintenance; Industry; *Job Analysis; *Occupational Clusters; Occupational Information; Office Machines; Research Methodology; *Task Analysis; Task Performance
IDENTIFIERS	Iowa

ABSTRACT

The research study was undertaken to provide data on skills and competencies to aid persons developing curricula for electromechanical technician training programs. Through a 73.8 percent return of 212 questionnaires distributed to Iowa electromechanical technicians, five occupational areas were identified as representative: residential appliance occupations, commercial appliance occupations, business and office machine occupations; industrial machinery and equipment occupations, and automated agribusiness equipment occupations. There exists a high correlation between the task performance of the five respondent groups; a core of common tasks was subdivided into nine task categories: diagnostic, maintenance and repair, measurement, clerical, instructional, miscellaneous, interpersonal, administrative, and safety. The latter three were emphasized by all groups. Skills pertaining to occupational areas individually were also identified. (The research method is described, equipment and task statements are listed, and task performances are rank ordered.) (This publication omits three appendixes containing tables presenting a visual display of relationship between responses, detailed analysis of task clusters, data on respondents' current and projected work performance, and the research questionnaire. A microfiche copy of the complete report is available from INFORMS, Department of Public Instruction, Grimes State Office Building, Des Moines, Iowa 50319.) (AG)

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THE

Electromechanical Cluster Occupations

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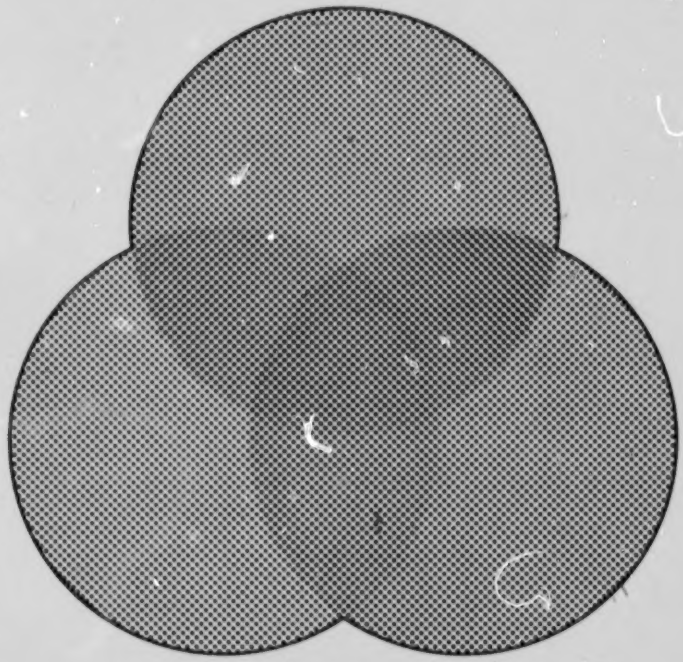

CE003394

Developed by the Department of Industrial Education
at Iowa State University in cooperation with the
Iowa Department of Public Instruction, 1974

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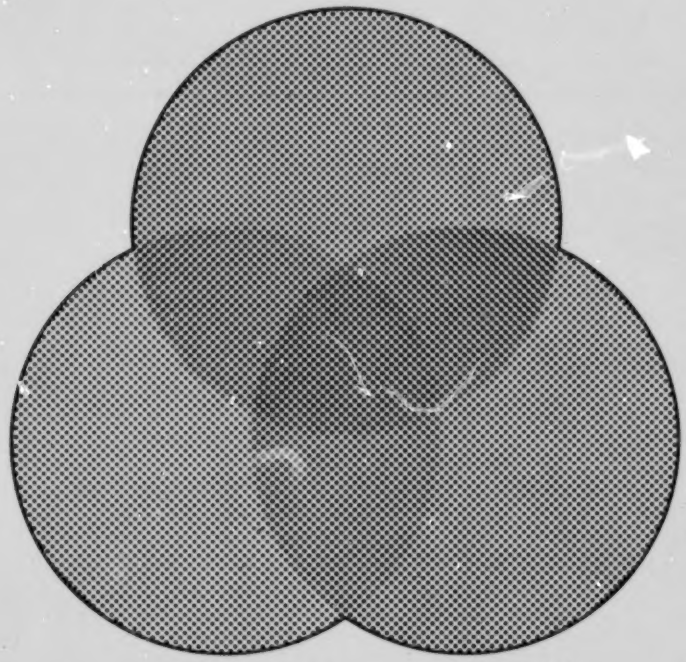

Developed by the Department of Industrial Education at Iowa State University
in cooperation with the Iowa Department of Public Instruction
under a research project funded by Part C, P.L. 90-576.

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PREFACE

Identification of Occupational Competencies in Services for Electromechanical Occupations was a research study undertaken to provide data of benefit to persons developing curricula for electromechanical technician training programs.

This publication is a shortened version of the final report of the research project. It omits Appendices D through F which contain tables presenting a visual display of relationship between responses, detailed analysis of task clusters, data on respondents' current and projected work performance, and the research questionnaire used.

The final report of the research project is available in its entirety on microfiche through INFORMS, Department of Public Instruction, Grimes State Office Building, Des Moines, Iowa 50319.

Copies of this publication are available without charge from the State Director, Career Education Division, Department of Public Instruction, Grimes State Office Building, Des Moines, Iowa 50319.

The activity which is the subject of this report was supported in whole or in part by the U.S. Office of Education, Department of Health, Education, and Welfare. However, the opinions expressed herein do not necessarily reflect the position or policy of the U.S. Office of Education, and no official endorsement by the U.S. Office of Education should be inferred.

Acknowledgments

Many individuals provided invaluable assistance in the completion of this research project. Although no complete list of these persons could be included, the following individuals were particularly helpful:

Mrs. Charlotte Bentley, Data Processing Statistician, ISU
Mr. Robert Koons, Manager of Industrial Relations, Clinton Corn Processing, Clinton, Iowa
Mrs. Cheryl Lowe, Secretary, ISU
Dr. David McWethy, Consultant, Career Education Division, Iowa Department of Public Instruction
Mr. Bud Meador, Senior Data Analyst, ISU
Dr. Anton Netusil, Associate Professor, ISU
Mr. I. J. Rocklin, Rocklin Manufacturing, Sioux City, Iowa
Mr. Roger Smith, Research/Teaching Assistant, ISU
Mrs. Judy Starling, Final Typist, ISU
Mrs. Robert Stone, Wife and Proofreader
Dr. Rex Thomas, Assistant Professor, ISU
Dr. William Wojansky, Head, Industrial Education Department, ISU
Dr. Kenneth Wold, Chief, Planning and Support Services, Iowa Department of Public Instruction
Dr. Leroy Wolins, Statistics Professor, ISU

To these individuals and to those whose names do not appear here, sincerest gratitude is expressed.

Robert D. Stone, Researcher

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INTRODUCTION

Iowa State University is committed to research and investigation which will contribute to the body of knowledge related to specific disciplines. Hopefully, such knowledge may have important implications for the further development and improvement of instructional programs. Much of today's research requires funding to carry out long-term research involving considerable time, effort, and research tools.

This electromechanical research project was funded for a three-year period by the State Department of Public Instruction and provided research opportunity and experiences for a doctoral student in Vocational-Technical Education, Robert Stone, under the direction of William Wolansky.

It has long been recognized that related technologies need to be clustered in order to establish commonalities of teachable skills and knowledge requirements. For instructional purposes, it should be possible to identify certain core educational experiences which would facilitate the learning or performance of a number of tasks within the cluster.

While several research projects have been carried out to derive a competency-matrix for occupational clusters, the research tools and techniques for determining the specific areas and extent of commonality between technologies or occupations have not been sufficiently developed.

The intent of this research was to investigate more effective research techniques and computer analysis procedures of the response data. These research methods would be designed to analyze tasks to determine the extent of their commonality and group such tasks in meaningful relationships. The findings of this research should minimize extraneous and repetitious curricular content while developing technical courses and training programs.

This study identifies the tasks which are common to the electromechanical occupations, the frequency with which these tasks are performed, the anticipated frequency with which such tasks will be performed five years hence, to determine the areas and extent of commonality between these tasks in selected occupations and to present the results of computerized analysis in an easily interpreted format.

The research method employed a statistical treatment of data to establish degrees of commonality in what appears to be a promising and manageable technique. While this technique is not refined, it has opened a new research horizon for clustering tasks in related families of occupations. Mr. Robert Stone has greatly benefited from his efforts in carrying this funded project to completion and hopefully he will extend the reported findings as he pursues his independent doctoral research which is related to this project.

As director, the financial support by the State Department of Public Instruction in Iowa has made it possible for the Department of Industrial Education at Iowa State University to engage doctoral students in meaningful research experiences. Hopefully, our interest and participation in research has produced a report that will have much relevant data for curriculum personnel in structuring responsive instructional courses and programs in the electromechanical cluster.

The research technique should have relevance to the problem of determining commonalities in other occupational clusters.

William D. Wolansky
Professor and Head
Department of Industrial Education

JUSTIFICATION FOR OCCUPATIONAL CLUSTERING

The technological aspects of society have progressed at an exponential rate during the last half of the twentieth century. This inundation of new concepts has, in the last twenty years, produced color television; laser communication, measurement, and guidance; solid state circuitry; micro miniaturization; and integrated circuits. Within the past ten years this technology has allowed man to walk on the face of the moon.

These new applications of scientific principles, wrought into physical substance, have introduced a proliferation of commercial and consumer goods into the lives of the American Public. These new products have provided the consumer with creature comforts and capabilities far greater than those afforded to even the most powerful individuals in other cultures. However, these conveniences are a mixed blessing, for to develop, produce and maintain these devices requires specialized skills. No longer can the "do-it-yourselfer" repair the clothes dryer. The simple record player is a thing of the past, replaced by one with a bewildering array of unrecognizable solid state components, whose maintenance requires specialized diagnostic tools and methods.

Stephens states:

> . . as innovations have been introduced, greater complexity has been added. This increased complexity has resulted in the need for a more intelligent and better trained person to keep the product operational. (1968, p. 1)

Stephens' research posits the need for an increased number of trained service personnel. However, these technicians must be the product of a new type of technical training.

Harris discusses this new generation of technician in this way:

> . . . (such skills) can be described as that portion of the total manpower spectrum which is concerned with jobs with a balanced cognitive-manipulative content. At one end of the middle manpower 'band' are jobs which are nearly professional (e.g., science research technicians). At the other end are jobs closely related to the skilled trades. (1968, p. 23)

It seems reasonable to assume that no one would contest the point that there has been significant growth in technology. What educators can or should do to communicate these new processes to their students is another matter.

This growth of knowledge in technical areas, electronics as an example, has caused the expansion of offerings in technical education programs. In general practice, these new subject matter areas are added to the existing coursework, or courses are added to present the new subject matter. This in turn leads to a graduate who has increased depth of knowledge in his technical area, but there is also a decrease in breadth of the individual's technical education. There is a decrease in his ability to apply this theoretical knowledge to technical areas other than his own. If the graduate is employed in a business that can utilize this depth of knowledge, the training program has been successful in performing its function. To the extent that this inability is a liability to the technician's employer, the training program has failed.

There are an increasing number of employment situations where this narrowness is a liability. In such areas as research and development, and the service areas of sales, installation, and maintenance, the individual is severely limited in his potential for advancement if he does not possess a broadly based ability to interpret data from several technical areas.

It would seem then that the ideal employees in these service areas should receive training in a variety of topics, but only at a cursory level. Quite to the contrary, the truth of the matter is that, while this person does need to be knowledgeable in a wide range of technical areas, the depth of knowledge in each area should approach that of the individual with a single technical competency. The problem now becomes one of providing the student with an understanding of this wide latitude of phenomena (and with depth in each technical area) in a time period that is compatible with other technical education courses. It is at this point that the clustering concept becomes a topic of particular interest.

Wolansky discusses clustering in these terms:

> A cluster of occupations is composed of recognized job titles which are logically related because they include similar or identical teachable skills and knowledge requirements. (1971, p. 7)

Cunningham refers to the concept in this way:

> Thus, when we speak of grouping jobs or occupations for educational purposes, we are assuming that jobs within a given cluster are similar in the sense that certain core educational experiences should be established which would facilitate the learning or performance of all jobs within the cluster (1969, p. 20)

Perhaps the clustering concept can be shown more graphically in Figure 1. Assume that each of the circles in Figure 1 represents the universe of skills and tasks performed by a person in a specific occupation. The areas at which two of these circles overlap represents the extent to which the two occupations share similar or identical tasks. The area at the center represents a core of activities common to all three of the occupations. If the extent of this overlap (and the specific areas in which the overlap exists) can be determined, then the educational experiences of all three groups can be streamlined by simultaneously exposing the three student groups to these topics of mutual interest.

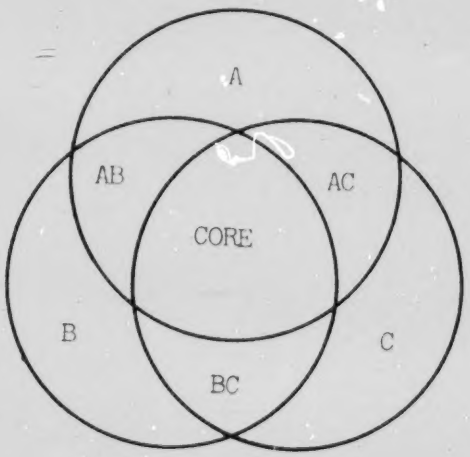


FIGURE 1

Concepts and skills pertinent to all should be presented to all three student groups as a whole. Further reductions of time, laboratory area, and expenditures for salaries and training aids may be realized by clustering groups A & B, B & C, or A & C for those skills pertinent to the two areas. The final training period should be devoted to those skills that are unique to each specific area and the further refinement of those skills learned in common.

The purposes of this study, then, were:

1. To identify occupations which perform electromechanical skills.

2. To identify the tasks performed by persons employed in these occupations, whose responsibilities encompass the electromechanical activities.

3. To determine the frequency with which these tasks are performed at the present time.

4. To obtain an estimate of the frequency with which tasks will be performed five years hence.

5. To determine the areas and the extent of commonality between these occupations.

6. To present the results of the analysis of these raw data in an easily interpreted format.

7. To present other peripheral data and written comments as was deemed of value in assessing the importance of these data.

Method of Procedure

Identification of electromechanical occupations. There was no efficient means of precisely identifying the employment areas in which electro-mechanical skills are performed. During conversations with workers and employers, it became apparent that persons were performing tasks that required a combination of electrical/electronic, mechanical, refrigeration, pneudraulic or other technical skills. Yet only a very few individuals had ever considered the person who performed these tasks as an electromechanical technician. Generally, these workers were classed simply as maintenance or servicemen. References such as the Dictionary of Occupational Titles (DOT), Volumes One and Two, and other sources, were used to review the types of tasks that must be performed by workers in various occupations. The determination of occupational areas to be included in the study were made using these sources, discussion with University and Department of Public Instruction staff, and the criteria shown below:

1. The occupations must be sufficiently complex that postsecondary education of some duration is necessary for job success.

2. The tasks performed must encompass approximately equal amounts of electrical/electronic and mechanical skill. Thus, the skills of radio/T.V. trades, the auto/power mechanics trades, and other skills of a similar nature were excluded from consideration.

3. The occupations must be performed by a significant number of persons in Iowa.

Five occupational areas were found that conform to these criteria:

1. Residential Appliance Occupations

2. Commercial Appliance Occupations

3. Business and Office Machine Occupations

4. Industrial Machinery and Equipment Occupations

5. Automated Agri-Business Equipment Occupations

Other occupations may also meet the above criteria. These five were selected as representative of all electromechanical skills in Iowa. A variety of occupational specialities might exist within each of these five areas.

Development of the instrument. Once the five occupational areas were selected, the DOT task lists and previously conducted studies were used as a starting point to develop the research instrument. Additional data were obtained from text materials for each occupational area and from service manuals. These materials were also used to develop lists of task statements.

The resource materials were not used as verbatim sources for questionnaire items. Each source book was scanned to determine the types of tasks the technicians might have to perform, and these tasks were then compiled for each source book. All task lists were subsequently merged into one comprehensive list and all duplicate tasks deleted. Additional tasks were deleted by removing the names of specific types of appliances or machines, and rewriting a single task statement to make it applicable to all areas. When completed, this list totaled 256 tasks.

The task list became the seventh section of a complex pilot questionnaire. Preceding the task list was a short series of personal profile items and five separate lists of machines/appliances and tools on which (or with which) the technicians might work (one list for each occupational category). Following the task list was an eighth and final section dealing with the interpersonal aspects of work.

An individual respondent would complete the personal profile, one section (the section dealing with the particular area in which he was employed) of the tool and equipment lists, the task list, and the interpersonal relations section. Response to the tool/equipment list and to the task statements required two responses per item. The first response indicated the respondent's present work frequency. The second was his estimation of work frequency five years from now. It was estimated that a time period of 1 to 1½ hours would be needed to complete the questionnaire.

Pretesting the instrument. The pilot instrument was mailed or personally delivered to at least two persons in each of the five areas to

be surveyed. Additionally the instrument was reviewed by the Department of Public Instruction staff, Iowa State University staff, and by several owners, managers, or administrative personnel in major corporations or commissions throughout Iowa.

Pilot respondents were asked to complete the questionnaire and to make any pertinent comments concerning modification of the instrument. Personal interviews were held with two pilot respondents and with three administrative level reviewers seeking their feelings concerning the changes that should be made in the instrument. In general, response to the pilot instrument was positive. The return of the pilot survey was in excess of 80% and several individuals asked to have additional copies that could be given to all of their maintenance or service personnel.

The responses, criticisms, and suggestions of the pilot respondents and reviewers were considered and a revised instrument developed. The revised instrument included:

1. Three additional items in the personal profile.
2. The addition of several items to the tool and equipment lists.
3. A restructuring of these lists.
4. The elimination of several items in the task list.
5. The total elimination of the interpersonal section.
6. The rewriting of this section as task statements and its incorporation into the list of task statements.
7. The addition of several task statements dealing with personal safety and OSHA standards.

The final instrument was composed of the personal profile, the five separate tool and equipment lists, and the list of task statements which had grown to 273.

Selection of the sample. As stated previously, no specific data were available from which a representative sample of electromechanical technicians could be drawn. It was determined that the selection of potential respondents must be drawn from several sources. Telephone directories from Iowa's fifteen major metropolitan areas and their suburbs were searched for the names and addresses of any business or industry that would fit one of the five categories of the survey. Names on this list, 950 in number, were contacted by a personal letter

explaining the purpose of the research and asking them to respond on an enclosed postal card if they would be willing to participate in the research. Response to this mailing (and two follow-up reminders) provided an acceptable potential respondent group in Residential Appliance Occupations and Business and Office Machine Occupations. An additional mailing and follow-up, and direct telephone contact were necessary to develop a sufficient number of potential respondents in each of the three remaining categories.

It was felt that a minimum of sixty potential respondents in each category was necessary before the sample population could be drawn. The largest potential respondent file was the Residential Appliance category with 106. The smallest was Agri-Business Equipment with 68.

The actual respondents were selected by numbering the list of potential respondents in each category, then entering a random number table and selecting forty-five names from each list.

Because several weeks had passed between the original mailing and the final respondent selection, the original contact in all 225 companies was contacted by telephone, and the project was reviewed. In several instances the research had been misunderstood, and when it was explained the contact indicated that he or his company would not be suited for the research project. One individual wanted a copy of the research results and had indicated an interest in the project for this reason; however, the individual was in charge of an MDTA training program in Business and Office Skills, not an employer of a machine service person. Other names were deleted from the list for similar reasons, and an adjusted total of 212 respondents was provided with copies of the questionnaire.

Collection of the data. Due to the large number of respondents, and the procedure used in contacting the respondents personally, distribution of the questionnaire extended over a three-week period.

Several of the first distributed instruments were returned before the final few were mailed. Approximately two weeks following the mailing of the questionnaire those who had not responded were again contacted by telephone. Three individuals stated that, once they saw the complexity of the questionnaire they would not complete it. Five persons stated that they had not received the original questionnaire, and in each of these cases another questionnaire was sent and received.

In the event that the first follow-up telephone call did not produce results, a second or third call would be made to the non-respondents. Six returns were not received although the individuals stated that they had completed the questionnaire and mailed the response sheets. It may be assumed that at least some of these statements were specious; however, two volunteered to re-complete the instrument and asked that a duplicate copy be sent.

In all, 165 responses were received, for a total return of 77.8%. Of these 165, nine were unsalvageable; thus 156 or a 73% useable return was obtained. It is noteworthy to mention again that in excess of an hour was necessary to complete the questionnaire. The fact that a large percentage of responses was received speaks well for the respondents' perceived importance of this study.

A breakdown of the respondent groups may be seen as follows in Table 1.

Analysis of the data. Upon receipt of a response it was checked for missing data or misinterpreted responses. In the event that such items were found, the respondent was again contacted by telephone to clear up the misunderstanding or obtain the missing data. In this way virtually all responses were salvaged. In six instances the respondent had completed such a small portion of the instrument that it was obvious that he had little or no interest in the study, or that his understanding of the instrument was such that any further attempt to obtain useable data would be useless. In the three remaining instances the respondent had returned only one of the two response sheets and, when contacted, indicated that the questionnaire booklet had been destroyed.

The response sheets were constructed in a manner such that data could be transferred directly from the sheets to punched cards. These response sheets were delivered to the University Computation Center where trained key punch operators punched and verified the data. Once punched and verified, an initial computer run was made to check the data for errors. Several items were found that had escaped earlier detection. These items were rechecked on the respondent's returns, and changes were made or the respondent was called to clarify any misunderstandings. These changes were made in the appropriate cards of each data set and the cards were then used to perform data analysis.

An analysis program called FASTABS was used to generate tabular data for the personal profile items. This program allows the responses for two variables to be compared and presented in a variety of ways. Tables were generated to show the differences in responses between the respondent categories. Other tables show the response differences according to respondent age. Summaries of the analyses may be seen in Tables 2, 3, and 4.

The FASTABS analysis of the Personal Profile by respondent group, Table 2, shows the youngest respondents as the Business and Office Machines group. This group also shows a higher percentage of on-the-job training, and a shorter time in their first position. Perhaps because the respondents are younger, they have not moved as far from their first position as is the case in other respondent groups. The Residential respondents show the greatest change between first and present position (Apprentice to Owner). They also indicate the greatest number of years on-the-job training. The Agri-Business respondents indicate the greatest amount of academic education, the lowest years of on-the-job training,

TABLE 1

Distribution of Questionnaire

Items	Residential	Commercial	Business	Industrial	Agri-business	Total
Questionnaires Distributed	47	40	40	47	38	212
Responses Returned	36	31	31	37	30	165
Unsalvageable Responses	2	4	—	1	2	9
Useable Responses	34	27	31	36	28	156
Percent Responses (Category)	76.6	77.5	77.5	78.7	78.9	---
Percent Responses (Total)	16.9	14.6	14.6	17.5	14.2	77.8
Percent Responses (Useable)	16.0	12.5	14.6	16.9	13.2	73.2

TABLE 2

Personal Profile By Respondent Group

Profile Item	Respondent Category				
	Residential (N=34)	Commercial (N=27)	Business and Office (N=31)	Industrial (N=36)	Agri-business (N=28)
Age (mean)	46.1	38.4	34.5	35.1	41.6
Years in Trade (mean)	15.2	13.8	10.7	10.6	14.7
Completed Apprenticeship	17 (50.0%)	13 (48.1%)	18 (58.1%)	11 (30.6%)	9 (32.1%)
Years of O. J. T. (mean)	2.1	1.2	1.7	1.7	0.7
Years Academic Education (mean)	12.3	11.7	12.7	13.0	13.6
1st Position Held (mode)	Apprentice	Apprentice/ Technician	Apprentice/ Technician	Apprentice	Laborer
Present Position (mode)	Owner	Supervisor/ Foreman	Technician	Technician	Supervisor/ Foreman
Occupational Goal (mode)	Owner	Owner/ Manager	Manager	Supervisor/ Foreman	Owner
Years in First Position (mean)	2.0	2.4	1.7	1.9	3.3
Years in Present Position (mean)	5.0	4.3	4.2	3.8	4.7
Level of Satisfaction (mean)	8.4	9.1	8.2	8.2	8.3

TABLE 3

Personal Profile By Respondent Age

Profile Item	Age Bracket				
	21-30 (N=33)	31-40 (N=52)	41-50 (N=38)	51-60 (N=27)	61-over (N=6)
Completed Apprenticeships	15 (9.6%)	20 (12.8%)	18 (11.6%)	12 (7.7%)	3 (1.9%)
O. J. T. Experience	24 (15.2%)	31 (19.9%)	23 (14.7%)	13 (8.3%)	6 (3.9%)
Years of Tech. Trng. (mean)	1.68	1.80	1.68	1.20	1.17
Years of Academic Educ. (mean)	12.6	14.3	12.8	12.5	11.0
Level of Satisfaction	8.00	8.47	8.40	8.91	9.67
Beginning Position (mode)	Laborer	Apprentice	Apprentice/ Unskilled	Apprentice	Apprentice
Present Position (mode)	Technician/ Supervisor/ Manager	Technician	Owner	Owner	Technician

TABLE 4

Personal Profile By Years of Technical Training

Profile Item		Years of Technical Training					
		Less Than 1	1-2	3-4	5-6	7-8	9-10
First Position (Rank Order)	1	Laborer	Technician	Apprentice	Apprentice	Technician	Laborer
	2	Apprentice	Apprentice	Technician	Journeyman		
	3	Unskilled	Unskilled	Owner	Technician		
Current Position (Rank Order)	1	Supervisor/ Foreman	Technician	Technician	Owner	Technician	Technician
	2	Owner	Supervisor/ Foreman	Owner	Manager		
	3	Manager	Manager	Manager	Supervisor/ Foreman		
Highest Position		Owner	Manager	Owner	Owner	Technician	Supervisor/Foreman

and longest period in their present position.

There is a high degree of job satisfaction across respondent groups, ranging from 8.2 (Business and Office, and Industrial) to 9.1 (Commercial).

Table 3 presents the Personal Profile data by respondent age. The largest number of respondents (52) were in the 31-40 age range, the smallest respondent group was the 61 and Over group with six respondents. It appears that the Apprenticeship training reached its peak in the 31-40 bracket, and that younger respondents may be achieving their training through other means. Presumably one of these means is the Vocational-Technical school.

The 31-40 age bracket also shows the highest percentage of respondents that have served an on-the-job training experience, the most years of technical training, and the most years of academic education.

There is nearly a direct relationship between age and level of job satisfaction. The highest level (9.67 of 10.0) is indicated by the 61 and Over respondent group. The lowest satisfaction level (8.00 of 10.0) is indicated by the 21-30 respondent group. This latter satisfaction level is by no means indicative of dissatisfaction. It simply appears to indicate that all respondents are, or have been, upward mobile and that they actively sought advancement. One might conjecture that the oldest respondents have achieved their goals and are satisfied with their positions. It might also be supposed that the slight dip in the satisfaction of the 41-50 respondents is typical of individuals in this age range who are re-assessing their career goals.

Tables of means were developed for the tool and equipment lists, and appear in Appendix A. Respondents complete only one of these sections; thus there is no relationship across respondent groups. These means are based on the following response categories:

1. Never perform the task.
2. Perform the task yearly (average).
3. Perform the task monthly (average).
4. Perform the task weekly (average).
5. Perform the task daily (average).

Each table presents the name of the equipment item, the present work frequency, the expected work frequency five years from now, and the difference between the two. The difference will be positive, negative, or zero for each item. If positive, the respondents feel the item in question will receive increased attention as the years pass. If the

difference is negative the respondents feel the item will receive less attention with the passage of time. No statistical inferences are made from these data; they are simply reported. The reader may use them as he or she deems appropriate to the development of course criteria.

Several analysis procedures were employed on the task list. The major procedure involved the performance of an analysis of variance (ANOVA) on each task statement to determine if there were a significant difference between the mean performance frequencies of the five respondent groups. If the ANOVA indicated that there was a significant difference between means; each of the ten possible pairs of means was tested with the Scheffe' test of significance. The Scheffe' test identifies specifically where the significant difference, or differences, lie. The results of this procedure were used to generate the Venn diagrams shown in Figures 3 and 4. Figure 3 represents the commonality of task performance at the present time. Figure 4 represents the commonality in the respondents' estimate of their task performance five years from now. The numbers that appear in the Venn diagrams are the numbers of the task statements that are performed in common, or separately, depending upon their location in the Venn diagram. The statements, and their appropriate numbers, may be found in Appendix B.

Figure 2 shows the logic process used for placement of the tasks within the Venn diagram. Abbreviations used in this flow chart are shown below, with an explanation of each:

1. G. T. - Greater Than
2. L. T. - Less Than
3. EQ - Equal To
4. F - F Test (A statistical test of significance)
5. s. d. - Standard Diviation

Items appearing in the Venn diagram are shown at two levels of significance. Those items appearing above the dashed line are performed frequently by the respondents. The mean performance frequency used as an arbitrary cutoff was 2.25. The reader will recall that a response of 2.0 indicates that the respondent performs the task approximately once per year, and that a response of 3.0 indicates monthly performance of the task. Because the responses of all respondents were averaged to obtain the mean performance frequency, it was felt that a figure of 2.25 would indicate that many of the respondents performed the task monthly or even weekly.

Figures appearing below the dotted line may be performed quite

Logic Process For Cluster Analysis

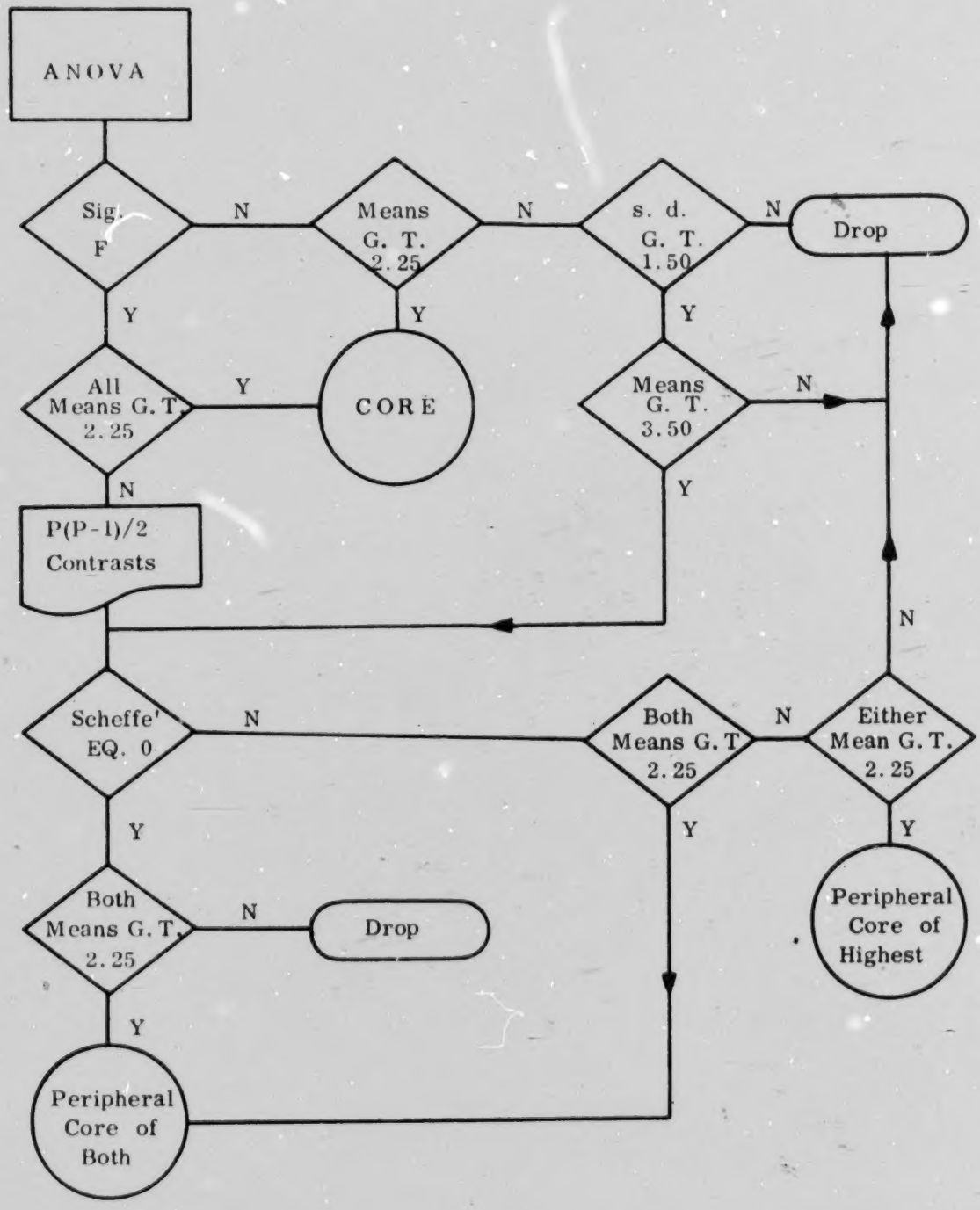
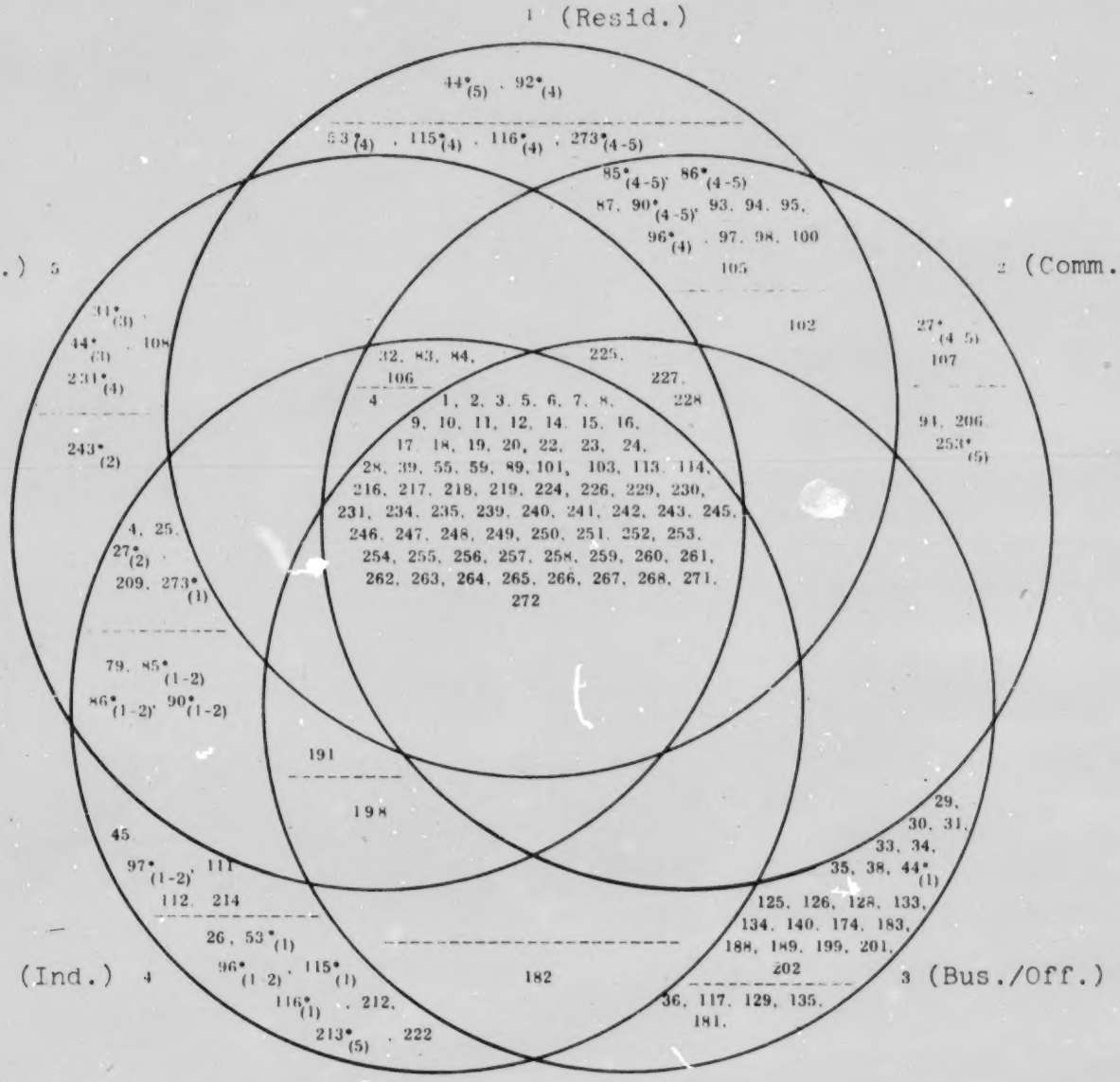


FIGURE 2

OCCUPATIONAL CLUSTER ANALYSIS

(PRESENT)

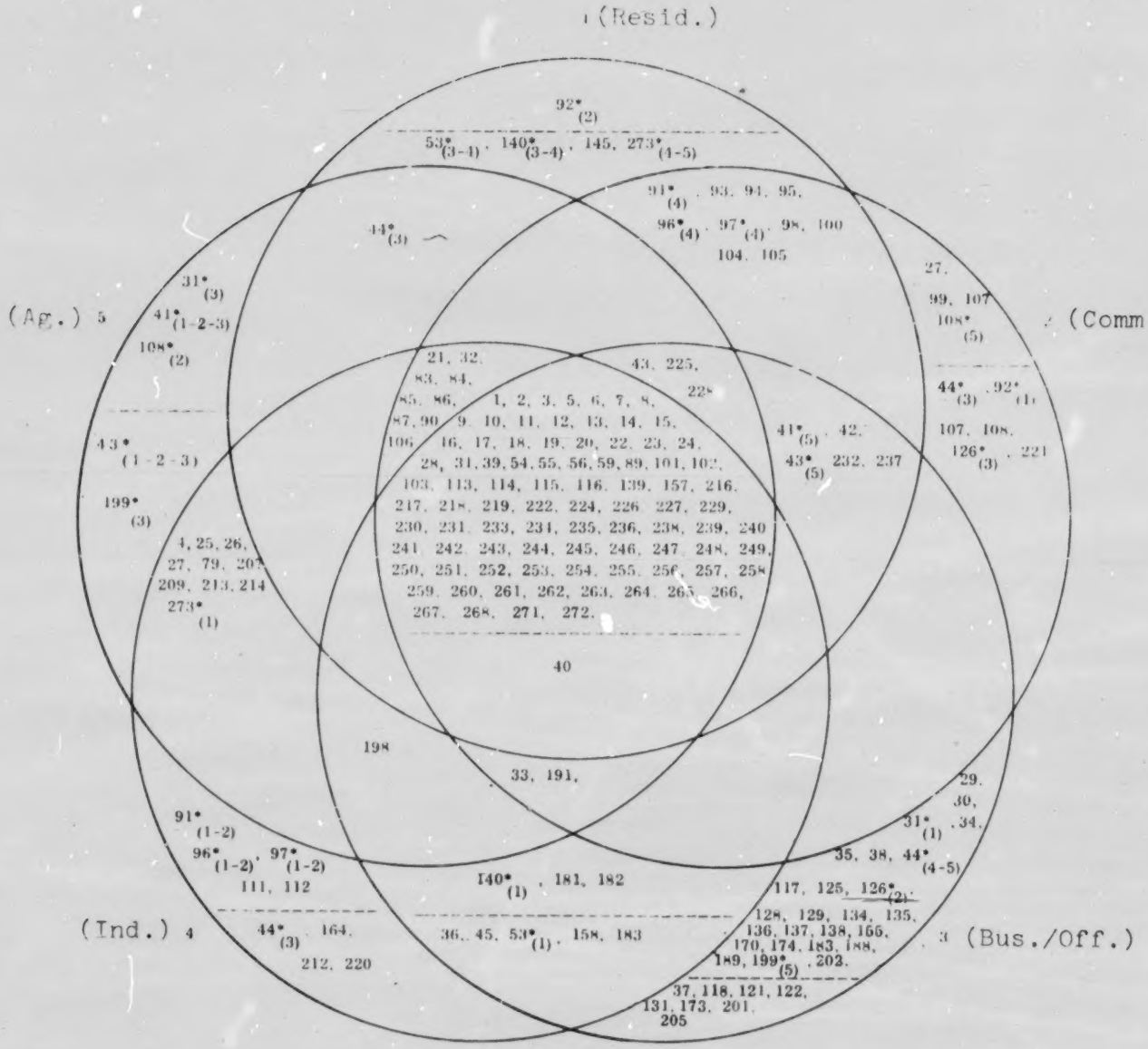


* Items appear in other sections of the diagram, indicated by the number in parenthesis.

FIGURE 3

OCCUPATIONAL CLUSTER ANALYSIS

(PROJECTED)



* Items appear in other sections of the diagram, indicated by the number in parenthesis.

FIGURE 4

frequently by some respondents and infrequently by others. Although the mean performance frequency was below 2.25, the standard deviation for the task was quite high. This would seem to indicate that several of the respondents performed the task quite frequently, perhaps daily. For this reason it was decided that these task statements should be displayed in the Venn diagram but that they should be separated from the others and displayed in such a way that the reader could distinguish the two groups.

The second analysis procedure used on the task list is presented in Tables 11 and 12. These tables display in descending order the tasks performed by each respondent group (Table 11 present, Table 12 projected). The task statement numbers are ranked according to the frequency of task performance by the respondent group. Each respondent group is represented by two columns of the table. The first column shows the task number; the second shows the mean performance frequency for the task.

ANALYSIS OF OCCUPATIONAL CLUSTERS

Figure 3 has a core of 72 tasks. As stated previously, these tasks are performed by all respondent groups, and are performed at least several times per year.

These core tasks may be grouped into nine general categories:

1. Diagnostic
2. Maintenance and Repair
3. Measurement
4. Clerical
5. Interpersonal
6. Administrative
7. Instructional
8. Safety
9. Miscellaneous

Typical items to be found in these categories are:

Diagnostic:

1. Locate and test system components

2. Refer to circuit schematics, engineering drawings, assembly drawings, etc.

3. Inspect slides, gibs, keyways, carriages, etc.

4. Test motor windings, pumps, etc.

Maintenance and Repair:

1. Remove, repair, and replace defective components such as switches, relays, solenoids, etc.

2. Disconnect electrical, hydraulic, or pneumatic connections before performing maintenance.

3. Repair or replace shafts, bearings, seals, etc.

4. Adjust equipment controls to meet manufacturers' specifications.

5. Make up or replace wiring harnesses.

Measurement:

1. Use feeler gauge, dial indicator, or other precision measuring device.

2. Measure or adjust flow rates through a circuit.

3. Make all necessary adjustments of internal controls.

Clerical:

1. Write purchase orders or requisitions.

2. Write or type business letters, reports, bills, etc.

3. Maintain time, service, or production records.

4. Supervise the budget and cost control of a department.

Interpersonal:

1. Perform your work as part of a team effort.

2. Work cooperatively with customers, supervisors, or other employees, even though you are under pressure.

3. Work with an agitated or angry customer, supervisor, or employee.

Administrative:

1. Act as a consultant to other service personnel.
2. Recommend changes in work procedures.
3. Interpret job specifications, work procedures, or company policy to others.
4. Analyze or resolve work problems between employees or between employees and management.
5. Develop work schedules for self or for others.

Instructional:

1. Instruct others in the proper method of testing or trouble-shooting.
2. Train new employees, or retrain and upgrade the training of present employees.

Safety:

1. Develop a safety program for your business or work site.
2. Enforce safety regulations.
3. Be aware of OSHA standards.
4. Perform safety inspections.

Miscellaneous:

1. Understand the organizational structure of your, or a customer's business.
2. Function as a team leader.
3. Improvise when regular diagnostic or maintenance procedures fail to locate or solve a problem.
4. Promote confidence in your product, service, company, or self.

In addition to this core area, there are tasks that are common to four, three, or two of the five groups. Generally these items could be included in one of the first eight of the foregoing categories. They are not included as core tasks primarily because the task statement refers to something that is not performed at all, or is performed very infrequently by the respondents in one or more of the response groups. Task statement number 32 is an example. The statement reads, "Purge air, water, or other impurities from hydraulic, air conditioning, or pneumatic systems." This task is performed quite frequently by individuals in the Home Appliance, Commercial, Industrial, and Agri-Business industries. However, it is performed infrequently or not at all by persons in the Business and Office Machine industry.

Other respondent groups indicated tasks that were unique to their occupational area. The largest of these was in the Business and Office Machine category. The respondents perform tasks in three categories not previously mentioned. They are:

1. Linkages and Levers
2. Transistor/Solid State/Logic Theory
3. Drive Systems

Representative task statements in each of these categories are as follows:

Linkages and Levers:

1. Measure/adjust linkage distances of simple or compound lever systems.
2. Understand the difference between different classes of levers.
3. Measure or adjust the operation of rotary lever systems.

Transistor/Solid State/Logic Theory:

1. Understand transistor theory, including common base, common emitter, and common collector designs.
2. Troubleshoot or replace logic gates or associated circuit components.
3. Perform circuit tests on printed circuit boards.

Drive Systems:

1. Understand the theory of escapement or other intermittent motion systems.

2. Inspect, clean, adjust, or repair smooth wheel drive mechanisms.

Respondents in the Industrial Equipment category indicated eight tasks that they perform independently from the other respondent groups. In general, these tasks relate to the operation of machine tools to perform such tasks as slotting, milling, and sheet metal fabrication, and the maintenance of hydraulic or pneumatic systems.

The Home Appliance respondents indicated no tasks that were performed independently. On the basis of this fact, it would seem that the Home Appliance technician, with a small amount of additional training, could move into any of the other response categories. Conversely, it would seem that the technicians in the other response categories could move into the Home Appliance category with little difficulty. This would seem to support the statement by Baer and Roeber in the text Occupational Information:

> Since most young people have a broad range of interests and capabilities, appropriate initial choices are facilitated by a knowledge of families of occupations. It is becoming more generally recognized that early training, even at the college level, should be broad enough to give the student the background for a group of related occupations. Thus he is not driven into a specific occupational choice before his interests have matured sufficiently for him to choose a field of work. Once hired, he has a better chance of promotion if he has been trained for a group of related occupations. Should he lose his job as a result of adverse business conditions or obsolescence of the occupation, he can switch to another job in the same occupational family. (Occupational Information, p. 167)

These authors have gone to the heart of clustering theory. The ability to provide a dynamic learning environment, in which a student can gain both depth and breadth of understanding, has been and continues to be the goal of technical educators. The data presented here, and the analysis procedures through which these data were derived, will provide a new approach toward curriculum development in electromechanical cluster occupations.

SUMMARY

The purpose of this study was to identify the cluster or clusters of skills and competencies that are performed by Electromechanical Technicians within the State of Iowa.

The results of this study have provided data that will be of benefit to persons charged with the responsibility for the development of curricula for electromechanical technician training programs. Other benefits that derive from this study are:

1. A research questionnaire that may be used as a model for the development of other research instruments.

2. An analysis procedure and rationale which may be of benefit to those individuals who wish to analyze performance in occupational clusters.

This research project identified five occupational areas which were deemed representative of electromechanical occupations in Iowa. These five areas were:

1. Residential Appliance Occupations

2. Commercial Appliance Occupations

3. Business and Office Machine Occupations

4. Industrial Machinery and Equipment Occupations

5. Automated Agri-Business Equipment Occupations

In all, 212 questionnaires were distributed. A useable return of 73.8% was used to generate the data presented in the report.

The results of the research have provided many insights into the electromechanical occupational cluster. It was found that there exists a high correlation between the task performance of the five respondent groups. All possible combinations of two respondent groups yielded 10 comparisons. The correlation for these comparisons ranged from .933 to .742. Further analysis indicated that there was a core of tasks common to all five respondent groups. This core could be subdivided into nine task categories. They are: Diagnostic, Maintenance and Repair, Measurement, Clerical, Interpersonal, Administrative, Instructional, Safety, and Miscellaneous. It was also found that there were lesser cores of tasks common to two or more of the five respondent groups.

An interesting finding of the study was the large emphasis, from all respondent groups, on administrative responsibilities, safety, and interpersonal relationships. These types of tasks are performed quite

frequently by the respondents, and a variety of tasks are performed.

In addition to the clustered skills, the research procedure was able to identify those skills which were performed by only one of the clustered occupations. The largest of these individual core areas was found in the Business and Office Machine response group. This core could be separated into three sub-categories:

1. Linkages and lever systems
2. Transistor/Integrated Circuit/Logic Theory
3. Drive Systems.

It may be concluded from this study that it is possible to analyze the tasks performed by workers in related occupational settings to determine the extent of the similarity between the tasks performed by these various groups.

These analysis procedures appear to be effective in differentiating groups of respondents according to the tasks they perform, and to provide a relatively inexpensive procedure for the analysis of clustered occupations.

The implementation of such a procedure can provide a firm base for decision making relative to curriculum development within occupational clusters. The relative ease with which the data can be analyzed allows the researcher to implement the procedure at regular intervals to determine if the trends in the occupations warrant the modification of curricula, and if so, the direction in which the modifications should be made.

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APPENDIX A

TOOL AND EQUIPMENT LISTS

Tables 5 through 9 present the responses of each of the respondent groups to their tool and equipment list. Each table presents the name of the item, the present and the projected work frequency, and the difference between the two.

Each table is separated into two major areas:

1. Appliances/machines/equipment on which the respondents perform electromechanical tasks.

2. The tools and maintainence equipment used by the respondents to perform these tasks.

At the end of each table there is a summary of additional equipment and tools that were mentioned by the respondents. No frequency data exist for these items.

TABLE 5

Home Appliance Occupations Equipment Lists

Equipment Item	Work Frequency		
	Present	Projected	Difference
RESIDENTIAL APPLIANCES			
Microwave Oven	1.71	2.68	.97
Gas/Electric Stove	3.32	3.35	.03
Air Conditioner (room)	3.21	3.27	.06
Air Conditioner (central)	2.70	3.00	.30
Refrigerator-Freezer	3.06	3.18	.12
Deepfreeze	2.74	2.88	.14
Washer (clothes)	3.56	3.62	.06
Washer (dish)	3.38	3.59	.21
Dryer	3.85	3.79	-.06
Garbage Disposal	2.53	2.76	.23
Trash Compactor	1.76	2.88	1.12
Furnace (gas, oil, electric)	2.82	2.91	.09
Humidifier	3.09	3.35	.26
Dehumidifier	2.38	2.71	.33
Garage Door Opener	1.26	1.47	.21
Electrostatic Air Purifier	1.88	2.56	.68
Water Heater	2.73	2.79	.06
Water Softener/Conditioner	1.76	2.06	.30
TEST EQUIPMENT & TOOLS			
Continuity Tester	4.21	4.23	.02
Volt-Ohmmeter	4.32	4.32	--
Vacuum Tube Voltmeter	1.68	1.68	--
Transistor Analyzer	1.26	1.59	.33
Oscilloscope	1.50	1.74	.24
Signal Generator	1.59	1.71	.12
Frequency Meter	1.32	1.47	.15
Interval Timer	1.46	1.61	.25
Thickness Gauges	2.29	2.38	.09
Light Meter	1.12	1.29	.17
Radiation Meter	1.26	1.91	.65
Soldering Equipment	4.29	4.32	.03
Welding/Brazing Equipment	3.26	3.44	.18
Pressure/Vacuum Meters	3.12	3.26	.14
Gas Detector	2.56	2.91	.35

TABLE 5 (Continued)

Equipment Item	Additional Items Suggested by Respondents
OTHER APPLIANCES AND EQUIPMENT	
Burglar Alarm Systems	
Central Vacuum Systems	
Credit Card Operated Devices	
Intercommunications Systems	
Recording Devices	
Security/Smoke Detection Equipment	
Water Pumps/Water Pressure Systems	
OTHER TEST EQUIPMENT AND TOOLS	
Charging Manifold	
Charging Valves	
Clamp-on Amprobe	
Combustion Analysis Equipment	
Electronic Leak Detector	
Infra Red Temperature Sensing Devices	
Sling Psychrometer	
Sound Level Meter	
Stethoscope (Audio Probe) Mechanical/Electronic	
Thermocouple (Temperature Sensing) Voltmeter	
Voltage/Pressure/Temperature Recording Devices	

TABLE 6

Commercial Appliance Occupations

Equipment Item	Work Frequency		
	Present	Projected	Difference
COMMERCIAL APPLIANCES			
Washer	1.64	1.72	.08
Dryer	1.64	1.76	.12
Extractor	1.08	1.12	.04
Ironer	1.00	1.00	--
Folder	1.00	1.00	--
Packaging/Wrapping Equipment	1.12	1.08	-.04
Pumps/Metering Equipment	1.60	1.68	.08
Pressure Regulating Devices	1.88	1.88	--
Flour/Sugar/Ingredient Measuring Equipment	1.20	1.20	--
Dough Mixers	1.24	1.24	--
Dough Forming Equipment	1.12	1.12	--
Panners/De-Panners	1.12	1.12	--
Proofing Equipment	1.12	1.12	--
Conveyor Systems	1.48	1.56	.08
Ovens	1.40	1.48	.08
Pressure/Temperature Regulating Equipment	1.68	1.80	.12
Product Preparation Equipment (slicing, frosting, etc.)	1.24	1.24	--
Packaging/Wrapping Equipment	1.33	1.42	.09
Raw Food Cleaning/Washing/ Filtering Equipment	1.24	1.32	.08
Raw Food Preparation Equipment (peeling, slicing, separating	1.20	1.20	--
Cooking/Freezing/Pasturizing/ Curing Equipment	1.44	1.56	.12
Pumping, Measuring, Metering Equipment	1.80	1.96	.16
Container Forming Equipment	1.12	1.24	.12
Conveyor Systems	1.48	1.52	.04
Heating/Refrigeration Systems	2.28	2.44	.16
Food Cases/Coolers	1.48	1.68	.20
Juke Box/Cassette Players	1.32	1.40	.08
Food/Drink/Cigarette Vendors	2.52	2.52	--
Automated Musical Instruments (piano, organ, etc.)	1.08	1.08	--
Amusement Devices (pin ball, billiard, etc.)	1.44	1.56	.12
Visual Devices (film, t.v., "shoot-the-bear", etc.)	1.40	1.52	.12
Coin Changers/Coin Chutes	2.56	2.60	.04
Bill Changers	1.76	1.92	.16

TABLE 6 (Continued)

Equipment Item	Work Frequency		
	Present	Projected	Difference
Heating/Refrigeration Equipment	2.64	2.84	.20
Pumping/Measuring/Metering Equipment	1.76	1.92	.16
Conveyor System	1.16	1.24	.08
Printing Press (letter press, offset, web, etc.)	1.28	1.28	--
Photographic Equipment (Process camera, platemaker, film processing, etc.)	1.36	1.40	.04
Materials Handling Equipment (paper, ink, chemicals)	1.44	1.44	—
Stitching/Stapling Equipment	1.24	1.28	.04
Shearing Equipment	1.28	1.32	.04
Packaging/Wrapping Equipment	1.36	1.40	.04
MAINTENANCE AND REPAIR EQUIPMENT			
Continuity Tester	3.48	3.60	.12
Volt-Ohmmeter	3.44	3.68	.24
Milliammeter/Ammeter	2.60	2.72	.12
Signal Generator	1.28	1.28	--
Oscilloscope	1.12	1.24	.12
Pressure/Vacuum Gauges	2.56	2.80	.24
Temperature Sensing Devices	3.04	3.28	.24
Volume/Flowmeters	1.56	1.72	.16
Gas/Fume Detectors	1.72	1.88	.16
Light Measuring Devices	1.24	1.48	.24
Sound Metering Devices	1.08	1.40	.32
Welding/Brazing Equipment	2.56	2.64	.08
Soldering Equipment	3.36	3.44	.08
Coin Mechanism Tester	2.00	2.16	.16
OTHER COMMERCIAL EQUIPMENT			
Automatic Photoprinting Machines			
Automatic Weighing/Wrapping Systems			
Food Pulpers			
Hydraulic/Pneumatic Systems			
Steam Cookers			
Tape Controlled Devices			
OTHER MAINTENANCE AND REPAIR EQUIPMENT			
Precision Metering/Weighing Devices			
Transistor Checker			

TABLE 7

Business and Office Machine Occupations

Equipment Item	Work Frequency		
	Present	Projected	Difference
BUSINESS MACHINES			
Typewriter	2.77	2.52	-.25
Adding Machine	2.84	2.68	-.16
Calculator(mechanical)	2.48	2.03	-.45
Calculator(electronic)	2.71	2.97	.26
Comptometer	1.03	1.13	.10
Check Sorting Equipment	1.42	1.47	.05
Cash Registers(mechanical)	1.45	1.48	.03
Cash Registers(electronic)	1.19	1.65	.46
Automated Inventory Equipment	1.36	1.39	.03
Shorthand Typewriter	1.07	1.17	.10
Transcription Equipment	2.03	2.16	.13
Photocopy Machines	2.68	2.58	-.10
Thermocopy Machines	1.58	1.52	-.06
Spirit Duplicator	1.77	1.71	-.06
Stencil Duplicator	1.77	1.74	-.03
Photo-Offset Duplicator	1.29	1.55	.26
Facimile Duplicator	1.23	1.23	---
Punched Tape/Magnetic Tape Duplicator	1.45	1.71	.25
Postage Meters	1.23	1.36	.13
Automatic Addressing/Labeling Equipment	1.58	1.71	.13
Intercommunication Equipment	1.65	1.94	.29
Central Processor	2.17	2.40	.23
Tape Drives	2.20	2.30	.10
Disc Drives	1.83	2.17	.34
Key Punch	1.40	1.33	-.07
Card Reader	2.07	2.07	---
Card Sorter	1.33	1.33	---
Reproducing Punch	1.53	1.57	.04
Verifier	1.50	1.43	-.07
CRT Devices	1.67	2.07	.40
Printer	2.10	2.30	.20
Plotter	1.10	1.33	.23
MAINTENANCE AND REPAIR EQUIPMENT			
Continuity Tester	3.67	3.70	.03
Volt-Ohmmeter	4.14	4.32	.18
Transistor Tester	1.56	2.26	.70
Transistor Curve Tracer	1.15	1.56	.41
Tube Tester	1.36	1.33	-.03
Pulse/Signal Generator	1.15	1.70	.55
Oscilloscope	2.52	3.33	.81

TABLE 7 (Continued)

Equipment Item	Work Frequency		
	Present	Projected	Difference
Interval Timer	1.26	1.41	.15
Light Meter	1.11	1.26	.15
Sound Meter	1.00	1.22	.22
Soldering Equipment	4.32	4.39	.07
Welding/Brazing Equipment	1.93	2.00	.07
Ultrasonic Parts Cleaner	1.15	1.82	.67

OTHER BUSINESS MACHINES

Automatic Time/Number Stamping Equipment
Billing/Accounting Machines
Central Recorders, Connected to Private Phone Systems
Collating Equipment
Desk Top Computers
Folding Equipment
Inserters
Letter Openers
Magnetic Tape Equipment
Scaling Equipment
Tape Punch/Tape Readers
Telephone Couplers
Teleprocessing Transmission Equipment

OTHER MAINTENANCE AND REPAIR EQUIPMENT

Agitation Type Chemical Cleaning Equipment
Locic Board Test and Maintainence Equipment
Signal Tracer

TABLE 8

Industrial Machinery and Equipment Occupations

Equipment Item	Work Frequency		
	Present	Projected	Difference
INDUSTRIAL MACHINERY AND EQUIPMENT			
Lathe (Engine, Turret)	2.77	2.87	.10
Lathe (Tracer)	1.55	1.72	.17
Milling Machine	2.90	3.07	.17
Broach	1.73	1.83	.10
EDM Equipment	1.27	1.60	.33
Drill (Radial, Mult. Spindle)	2.90	3.13	.23
Presses	3.30	3.43	.13
Bending Equipment (Rod, Tube, Sheet)	2.90	3.10	.20
Grinder (Tool, Centerless, etc.)	3.00	3.17	.17
Heat Treating Equipment	2.17	2.53	.36
Metal Plating Equipment	1.27	2.30	.03
Polishing/Painting Equipment	2.77	2.90	.13
Conveyor/Assembly Line Eqpt.	2.70	2.90	.20
Hydraulic/Pneumatic Systems	3.23	3.50	.27
Tape Controlled Devices	1.67	2.23	.56
Foundry Equipment	1.60	1.73	.13
Grinding/Mixing Equipment	1.38	1.45	.07
Extrusion/Molding Equipment	1.14	1.21	.07
Coating/Embedment Equipment	1.10	1.14	.04
Dipping Equipment	1.31	1.41	.10
Mold Making Equipment	1.14	1.14	---
Pumping Equipment	1.69	1.76	.07
Curing Equipment	1.59	1.59	---
Temperature/Pressure Controls	1.48	1.55	.07
Quality Control Equipment	1.45	1.52	.07
Materials Transport Systems	1.38	1.41	.03
Batch Mixing Equipment	1.38	1.41	.03
Extrusion Equipment	1.53	1.70	.17
Vacuum Forming Equipment	1.53	1.73	.20
Blow Molding Equipment	1.10	1.17	.07
Rotocasting Equipment	1.33	1.40	.07
Injection Molding Equipment	1.60	1.63	.03
Compression Molding Equipment	1.07	1.20	.13
Seam Welding Equipment	1.40	1.50	.10
Package Forming Equipment	1.50	1.53	.03
Cutting/Polishing Equipment	1.97	2.03	.06
Materials Conveyor Systems	1.67	1.70	.03
Fluid/Gas Pumping Equipment	1.70	1.83	.13
Metering Equipment	1.80	1.83	.03
Temperature Control Devices	2.07	2.13	.06
Quality Control Devices	1.53	1.60	.07

TABLE 8 (Continued)

Equipment Item	Work Frequency		
	Present	Projected	Difference
MAINTENANCE AND REPAIR EQUIPMENT			
Precision Level	2.27	2.43	.16
Sine Bar	1.35	1.48	.13
Feeler Gauge	3.17	3.33	.16
Dial Indicator	3.07	3.20	.13
Micrometer/Vernier Caliper	2.87	2.97	.10
High Speed Photographic Eqpt.	1.23	1.37	.14
Continuity Tester	3.37	3.53	.16
Volt/Amp/Ohmmeter	3.93	3.97	.04
Signal Generator	1.57	1.77	.20
Oscilloscope	1.97	2.23	.26
Magnaflux Equipment	1.40	1.57	.17
Heat Measuring Equipment	2.30	2.50	.20
Pressure Measuring Equipment	2.87	3.10	.23
Interval Timers	2.70	2.97	.27
Fume Detection Equipment	1.27	1.83	.56
OTHER INDUSTRIAL MACHINERY AND EQUIPMENT			
Boiler Equipment/Boiler Controls			
Environmental Chambers			
Fan/Limit Conttols			
Film Sealing Equipment			
Life Cycling Equipment			
Make-up Units			
Material Cooling Chillers			
Pneumatic Balance Controls			
Power Transmission Systems			
Shake Table			
Shock Tester			
Switch Gear			
OTHER MAINTENANCE AND REPAIR EQUIPMENT			
Density Measuring Equipment			
R. F. Communications Equipment			
R. F. Generator Test Equipment			
R. F. Inductive Heating Equipment			
Solid State/Logic Equipment			

TABLE 9

AUTOMATED AGRI-BUSINESS EQUIPMENT OCCUPATIONS

Equipment Item	Work Frequency		
	Present	Projected	Difference
AGRICULTURAL EQUIPMENT			
Feed Blending Equipment	2.77	3.54	.77
Feed Supplement Mfg. Eqpt.	2.00	2.15	.15
Automated Feeding Systems	3.04	3.23	.19
Automated Egg Handling Eqpt.	1.76	2.00	.24
Automated Milk Handling Eqpt.	1.58	1.63	.05
Automated Grain Handling Eqpt.	2.85	3.15	.30
Automated Poultry Dressing Eqpt.	1.67	1.63	-.04
Automated Waste Removal Eqpt.	2.04	2.75	.71
MAINTENANCE AND REPAIR EQUIPMENT			
Precision Metering Eqpt.	3.19	3.38	.19
Weight Scaling Eqpt.	3.08	3.46	.38
Continuity Tester	3.12	3.24	.12
Volt/Amp/Ohmmeter	3.52	3.80	.28
Interval Timer	2.72	2.80	.08
Pressure/Vacuum Gauges	3.15	3.46	.31
Temperature Sensing Devices	3.28	3.68	.40

OTHER AGRICULTURAL EQUIPMENT

Air Handling Equipment
Automated Heating/Drying Equipment
Automated Watering Systems
Counting Equipment
Electronic Monitoring Panels
Fork Lift Truck Circuitry
Magnetic Starters
Phase Converters(Rotary and Static)
Processing Plant Equipment
Refrigeration Equipment
Timing Relays
Ventilation/Grain Drying Equipment

OTHER MAINTENANCE AND REPAIR EQUIPMENT

Automated Forage Dry Matter Tester
Electronic/Chemical Feed Nutrient Tester
Ground Loop Impedance Tester/Cable Tracer
Hydraulic Stress Analysis Equipment
Motor Rotation Indicators/Phase Sequence Indicators
Voltage/Amperage Recorders
Welding Equipment

APPENDIX B

TASK STATEMENT LIST

TABLE 10

Task Number	Task Statement
1.	Locate and test system components to determine if they are functioning properly?
2.	Refer to a circuit schematic or a circuit diagram to aid in tracing an electric, hydraulic, or pneumatic circuit?
3.	Refer to engineering drawings or machine drawings?
4.	Refer to building blueprints or architectural plans?
5.	Disconnect electrical, hydraulic, or pneumatic connections before performing maintenance or repair on a piece of equipment?
6.	Remove, repair, or replace defective components such as switches, circuit breakers, thermocouples, solenoids, valves, relays, etc?
7.	Remove dust and dirt from the interior or exterior of motors, housings, gearcases, etc.?
8.	Inspect commutator, slip rings or brush gear of motors or generators?
9.	Inspect motor controls such as centrifugal switches for proper operation?
10.	Clean and adjust motor or starter contacts?
11.	Test motor windings for short circuits, grounds, open circuits, or burn-outs?
12.	Repair or replace defective starter or starter components?
13.	Connect external resistance, capacitance, or other "dummy load" to equipment under test for purposes of equipment adjustement?
14.	Make sketches of equipment sub-assemblies during disassembly or for reference during reassembly?
15.	Refer to manufacturer's assembly drawings to assure proper reassembly of equipment?
16.	Maintain service records on machines or equipment serviced?
17.	Use feeler gauge, dial indicator, or other precision measuring device to make precise adjustments?

Task Number	Task Statement
18.	Refer to parts list or manual to determine the proper name and part number for replacement parts?
19.	Write a purchase order or requisition for parts (or other materials)?
20.	Refer to service manual to determine the proper service or calibration procedure tolerances, etc.?
21.	Refer to electrical codes to determine proper wire size, or overload protection necessary for equipment installation?
22.	Adjust equipment controls to settings other than those specified by the manufacturer, to get optimum performance from the equipment being serviced?
23.	Inspect slides, gibs, keyways, carriages, shafts, bearings, etc., for excess wear, improper clearance, or misalignment?
24.	Repair or replace shafts, bearings, seals, etc.?
25.	Inspect hydraulic or pneumatic cylinders, rams, or pistons for wear, pitting, scratches, out-of-round, etc.?
26.	Inspect hydraulic or pneumatic pumps for proper pressure and capacity?
27.	Inspect and repair pressure or volume control valves, using visual means, micrometer, pressure gauges, etc.?
28.	Inspect and adjust drive belt tension, or alignment.
29.	Measure/adjust clutch plate pressure to meet manufacturer's specifications?
30.	Repair or replace clutch systems?
31.	Inspect gear teeth for excess wear, misalignment mesh depth, etc.?
32.	Purge air, water, or other impurities from hydraulic, air conditioning, or pneumatic systems?
33.	Measure/adjust linkage distances of simple or compound lever systems?

Task Number	Task Statement
34.	Measure/adjust the mechanical advantage or speed change of simple or compound lever systems?
35.	Determine the proper amount of force (or leverage) necessary to produce the desired operation of a machine, or machine sub-assembly?
36.	Understand the difference between different classes of levers?
37.	Explain the different classes of levers to another person?
38.	Measure or adjust the operation of rotary lever systems, such as rocker arm assemblies, or bell cranks?
39.	Estimate the time and/or material necessary to repair defective equipment?
40.	Inform the customer, in writing or verbally, of the cost estimate for service or repair?
41.	Compute final bill for services, installation or repair?
42.	Receive payment from customer for services?
43.	Write receipt for payment received?
44.	Maintain account books for service, maintenance and repair?
45.	Understand the theory of a time constant?
46.	Use time constant theory to compute the expected voltage, pressure, etc. in a device at specific time intervals, under charging or discharging conditions?
47.	Explain time constant theory to others?
48.	Instruct others in the procedure for computing time constant values?
49.	Understand the theory of resonance and resonant circuits?
50.	Use resonance theory to test or adjust resonance point of a circuit?
51.	Modify manufacturer's specifications for resonance point to obtain maximum efficiency from the equipment being serviced?

Task Number	Task Statement
52.	Design or redesign resonant circuits?
53.	Compute or measure Real Opposition to flow (electrical, fluid or pneumatic)?
54.	Perform circuit test to insure continuity, or isolate excessive pressure drops (electrical, fluid, or pneumatic)?
55.	Measure or adjust rate of flow within or through a circuit (electrical, fluid, pneumatic, or mechanical)?
56.	Compute or measure energy storage or energy transfer in a system (electrical, hydraulic, pneumatic, or mechanical)?
57.	Design an amplifier or power transfer circuit or system (electrical, fluid, pneumatic, or mechanical)?
58.	Explain a power transfer circuit or system to others?
59.	Instruct others in the proper method of system testing or troubleshooting?
60.	Understand the theory of operation of syncro-transmitter, syncro-transformer, and/or syncro receiver systems?
61.	Use the theory of syncro devices to troubleshoot and service syncro systems?
62.	Instruct others in the procedures for troubleshooting and servicing of syncro systems?
63.	Connect a syncro transmitter and receiver to produce a specific type of receiver rotation (positive, negative, lead, lag, additive, subtractive)?
64.	Understand the theory of saturable core reactors?
65.	Use the theory of saturable core devices to perform maintenance and repair of these devices?
66.	Instruct others in the theory and/or repair of saturable core devices?
67.	Compute or measure the magnetic flux density within a magnetic field, or magnetically shielded area?

Task Number	Task Statement
68.	Design or modify shields to adjust magnetic flux density?
69.	Compute or measure the efficiency of A C or D C motors, using mathematical formulas, or test devices?
70.	Understand the theory of transformer turns ratio?
71.	Compute or measure the power loss or efficiency of a transformer?
72.	Use the turns ratio theory to determine the approximate turns ratio, or step-up/step-down voltages of a transformer?
73.	Explain turns ratio theory to others?
74.	Understand the operation of Numerical Controlled machines or devices?
75.	Write Numerical Controlled programs?
76.	Modify or de-bug Numerical Controlled programs?
77.	Instruct other in Numerical Controlled coding or programs?
78.	Determine the machining to be accomplished on a part so that a Numerical Controlled program can be written?
79.	Determine what machines and what tools are to be used to perform the necessary machining on a part?
80.	Refer to speed and feed tables to determine machine tool cutting speeds to be used?
81.	Use trigonometry functions to determine X, Y, and Z coordinates of a Numerical Control program?
82.	Put data into written form for reporting purposes, so that others can code N. C. programs?
83.	Perform routine air compressor, refrigeration, or hydraulic pump maintenance?
84.	Clean, repair, or replace filter elements in the above equipment?
85.	Check or re-calibrate thermostats, humidity and pressure controls, or other similar devices?

Task Number	Task Statement
86.	Inspect and adjust pressure compensating or reducing valves?
87.	Repair or replace pressure or vacuum switches, humidity controls, or other packing materials?
88.	Disassemble, clean and repack valves using packing rope or other packing materials?
89.	Connect jumper wires or by-pass connections to check the function of components or assemblies?
90.	Determine the high side/low side pressure differential in an electrical, hydraulic, pneumatic, or other system?
91.	Adjust pressure readings (of gasses) for Standard Temperature and Pressure?
92.	Diagnose probable cause of incorrect pressure differential?
93.	Determine evaporator temperature (air conditioner)?
94.	Test suction of evaporator pressure regulator or absolute valve?
95.	Perform leak tests on pressure or vacuum systems, using dye, or other leak detection equipment?
96.	Replace refrigerant, water, gas, or other material in a system to restore it to proper level?
97.	Conduct performance tests on air conditioning, refrigeration, pneumatic or hydraulic systems?
98.	Remove compressor or pump from system so that it can be rebuilt?
99.	Completely strip or disassemblecompressor or pump so that it can be repaired?
100.	Evacuate refrigeration or air conditioning system using a vacuum pump or charging station?
101.	Inspect system wiring, tighten terminal screws, re-solder connections, etc.?
102.	Inspect, repair, or replace shock mounts, vibration dampers, etc.?
103.	Inspect, adjust, repair, or replace overload protective devices?

Task Number	Task Statement
104.	Analyze load on cooling system to determine if the equipment is operating under an overload?
105.	Attempt to move a restriction in a sealed refrigeration, hydraulic, or pneumatic systems?
106.	Measure machine or product temperature and adjust temperature controls as necessary?
107.	Install, repair, or replace heating or cooling packages to maintain proper operating temperatures for large equipment or appliances?
108.	Perform inspection and maintenance of cooling towers, water treatment equipment, air supply systems, and the like?
109.	Understand the basic theory of chemistry to do your work?
110.	Use basic chemistry to perform your work?
111.	Understand the operation of a slide rule?
112.	Use a slide rule to derive data for your work?
113.	Use a pocket or desk calculator to perform your work?
114.	Make up or repair wiring harnesses?
115.	Test, adjust, repair or replace equipment instrumentation?
116.	Test, adjust, repair, or replace components in your personal test equipment?
117.	Understand binary arithmetic or Boolean algebra?
118.	Use binary arithmetic to trace through the operation of a logic circuit?
119.	Use Boolean algebra to determine the gating or switching operation of a logic circuit?
120.	Use the above to design or redesign a logic circuit?
121.	Convert from one number system to another? (binary to decimal, octal to hexa-decimal, etc.)
122.	Understand the operation of a diode clipping circuit or other wave shaping device?

Task Number	Task Statement
123.	Troubleshoot or repair a clipping or other wave shaping device?
124.	Modify or redesign a wave shaping circuit?
125.	Understand transistor theory, including common base, common emitter, and common collector designs?
126.	Troubleshoot or repair transistor amplifier or switching circuits?
127.	Design or modify transistor amplifier or switching circuits?
128.	Troubleshoot or replace logic gates or associated circuit components?
129.	Read and interpret symbolic diagrams of RTL, TTL, DCTL, or other logic families?
130.	Construct truth tables as an aid in logic circuit troubleshooting?
131.	Explain the theory of logic circuits to others?
132.	Explain transistor theory to others?
133.	Connect an oscilloscope to circuit components?
134.	Analyze oscilloscope waveforms to determine the type of equipment malfunctions?
135.	Determine pulse or wave duration or intensity with an oscilloscope?
136.	Record pulse shape or duration using an oscilloscope or recording device?
137.	Analyze oscilloscope patterns to determine if the oscilloscope probe, or the oscilloscope itself, is properly adjusted?
138.	Adjust oscilloscope or probe to conform with proper operating standards?
139.	Instruct others in the proper use or maintenance of test equipment?
140.	Perform circuit tests on printed circuit boards?
141.	Modify a PC board to perform the repair of some defect?

Task Number	Task Statement
142.	Design, or modify the design, of a PC layout?
143.	Expose, etch or otherwise construct PC boards?
144.	Measure light intensity, spectral quality, or evenness of illumination?
145.	Measure the level of radiation from a microwave oven or other radiation emitting device, using a radiation counter or other measuring device?
146.	Understand the inverse square law of light intensity?
147.	Use the inverse equare law to estimate or compute light intensity?
148.	Perform maintainence or tests using optical measuring devices, such as lasers, optical galvanometer, etc.?
149.	Determine the focal length of a lens, mirror, or parabolic reflector?
150.	Determine the index of refraction of various transparent materials?
151.	Determine or adjust the alignment of light polarizers?
152.	Inspect, clean, adjust the alignment of beam splitting mirrors or prisms?
153.	Inspect, adjust, or redesign laser beams?
154.	Inspect, clean, adjust or replace optical lenses, mirrors or lens assemblies?
155.	Inspect, clean, adjust or replace photoelectric sensors or associated eqpt.?
156.	Explain light measurement to others?
157.	Measure or compute resistance or capacitance of series or parallel circuits?
158.	Modify Ohm's Law, Watt's Law, etc., to determine the values of circuit components?
159.	Explain series, parallel, or series-parallel circuits to others?

Task Number	Task Statement
160.	Understand the theory of impedance matching?
161.	Maintain or adjust impedance matching circuitry?
162.	Analyze, design, or modify impedance matching circuitry?
163.	Explain impedance matching principles to others?
164.	Understand the principles of feedback?
165.	Use feedback theory to measure or adjust feedback values to meet equipment specs.?
166.	Adapt manufacturer's feedback specs. to fit a particular need, or to obtain optimum performance from the equipment being serviced?
167.	Determine phase relationship between original and feedback signal, to determine if the signal is regenerative or degenerative?
168.	Explain feedback fundamentals to others?
169.	Instruct others in the proper method of measuring or adjusting feedback?
170.	Understand the theory of circuit bias?
171.	Measure bias values and adjust as necessary to obtain optimum circuit output?
172.	Instruct others in proper procedures for bias measurement and adjustment?
173.	Inject a test signal and check circuit output to determine output level, or to adjust for minimum distortion?
174.	Visually inspect circuit components for causes of spurious oscillation, noise, or malfunction?
175.	Test vacuum tubes to insure that they meet or exceed standard specs.?
176.	Measure or calculate gain of an amplifier circuit?
177.	Measure or calculate input or lead resistance of an amplifier?

Task Number	Task Statement
178.	Plot load line(s) for a transistor or vacuum tube circuit?
179.	Explain load line theory to another person?
180.	Measure leakage of a filter or coupling capacitor?
181.	Modify electrical, hydraulic, pneumatic, or mechanical devices according to update specifications from the manufacturer?
182.	Understand the theory of linkage devices of systems?
183.	Maintain equipment utilizing linkage elements?
184.	Construct link point curves to analyze the operation of a linkage system?
185.	Determine the location of centers-of-rotation for linkage elements?
186.	Design or modify a linkage system to meet the needs of a situation?
187.	Construct vector diagrams or force polygons to analyze the force, velocity, mechanical advantage, etc. of a linkage system?
188.	Understand the theory of escapement or other intermittent motion systems?
189.	Inspect, maintain, or repair escapement systems?
190.	Design or modify escapement or other intermittent motion systems?
191.	Remove or refit gears to shafts?
192.	Rework the bore of a gear to restore concentricity?
193.	Rebuild gear teeth, shafts, rollers, etc.?
194.	Measure pitch diameter, diametral pitch or other gear geometrics?
195.	Explain gear geometry to others?
196.	Determine the increase or decrease in angular velocity due to simple or compound gear trains?

Task Number	Task Statement
197.	Determine the mechanical advantage of a gear train?
198.	Inspect, test, or repair spring drives, or chain drive mechanisms?
199.	Inspect, clean, adjust or repair smooth wheel drive mechanisms?
200.	Modify or re-design smooth wheel, spring, or chain drive systems?
201.	Measure or adjust angular timing of rotary cam systems?
202.	Measure or adjust clearance between cam and cam follower?
203.	Design or modify cam systems to perform specific types of motion, timing, product distribution, etc.?
204.	Instruct others in the fundamentals of cam design?
205.	Instruct others in the proper method of inspection, repair, or maintainence of cam operated systems?
206.	Inspect, clean, repair, or replace magnetic counters, coin operated devices, or other magnetic detection equipment?
207.	Refer to manuals to determine strength of materials? (Physical, Chemical, Electrical, Thermal, etc.)
208.	Measure the physical properties of materials as mentioned above?
209.	Refer to sketches or drawings to construct a component part?
210.	Heat treat, anneal, temper or otherwise alter the properties of a component or piece of metal?
211.	Chemically alter the structural or molecular properties of materials?
212.	Perform slotting, milling or other operations on a milling machine?
213.	Perform grinding operations using a surface, centerless or other type of grinder?
214.	Perform operations on sheet metal, using sheet metal machines?
215.	Perform exhaust gas analysis or other byproduct analysis of a machine or system?

Task Number	Task Statement
216.	Write or type business letters, reports, bills, etc.?
217.	Make oral reports, or presentations to customers, employer, employees, or other persons?
218.	Act as a consultant to other service personnel in your company or in other companies?
219.	Assist a customer in determining the size or other specifications of proposed equipment?
220.	Write specs for new equipment, or components, to be bid?
221.	Write specs for proposed equipment installations for customers?
222.	Make tentative sketches of proposed equipment installation?
223.	Transfer rough sketches to finished scale drawings?
224.	Write purchase orders or equipment requisitions?
225.	Sign shipping receipt or bill of lading for a new shipment?
226.	Check a shipment for transit damage?
227.	Locate invoice and inventory all invoiced items?
228.	List missing or damaged items on invoice or lading slip?
229.	Make preparations for installation of new equipment?
230.	Obtain, read, or otherwise interpret installation plans?
231.	Assemble equipment from shipping crates, according to manufacturer's specs or installation plan?
232.	Make initial installation and adjustment of new equipment at customer's installation site?
234.	Circuit test all components, subassemblies, etc., referring to manufacturer's test points and specs.?
235.	Make all necessary adjustments of internal controls to bring the installation to optimum working conditions?
236.	Instruct or supervise others in the performance of the spec. writing, bidding or installation duties?

Task Number	Task Statement
237.	Instruct customer in the proper daily or periodic maintenance of the equipment?
238.	Answer customer's questions, or interpret company policy and procedures?
239.	Interpret job specifications, work orders or company policy to other workers?
240.	Recommend changes in work procedures to increase efficiency or quality of work?
241.	Recommend changes in working conditions to increase productivity or safety?
242.	Analyze or resolve work problems between workers?
243.	Analyze or resolve work problems between workers and management?
244.	Recommend or carry out personnel activities, such as hiring, promotion, transfer, termination, etc.?
245.	Train new employees in proper procedures?
246.	Re-train or upgrade the training of present employees?
247.	Maintain time, service, production, or other business records?
248.	Develop your own work schedule, appointment list, etc.?
249.	Develop work schedule or job assignments for other persons?
250.	Establish or supervise a maintenance or service department?
251.	Supervise the budget and cost control of a department?
252.	Develop a safety program for your business or work site?
253.	Enforce safety regulations, set down by you or your employer?
254.	Understand the organizational structure of your business or a customer's business?
255.	Receive instruction or help in understanding some aspect of your work?

Task Number	Task Statement
256.	Improvise when regular diagnostic techniques fail to locate a problem?
257.	Perform your work as a part of a team effort?
258.	Function as the leader of a team effort?
259.	Work cooperatively with customers, supervisors, or other employees, even though you are under pressure?
260.	Work with an agitated or angry customer, supervisor, or employee?
261.	Tactfully ask questions of a customer, supervisor, or employee to get additional information?
262.	Promote confidence in your product, service, company, workmanship, or yourself?
263.	Be aware of or diagnose an unsafe working practice of yourself or another person?
264.	Be aware of or diagnose a safety hazard caused by machine or physical facilities?
265.	Be aware of OSHA standards?
266.	Keep a customer or supervisor informed of potential or existing safety hazards or problems?
267.	Reorganize your plant, work habits, or work procedures to conform with OSHA standards?
268.	Perform safety inspections of your plant or work area?
269.	Attend safety lectures or seminars?
270.	Instruct or be responsible for instruction at safety lectures or seminars?
271.	How often do you feel the need for more instruction in writing letters, reports, or other communication skills?
272.	How often do you feel the need for more instruction in your skill areas (Electronics, Refrigeration, Mechanics, etc.)?
273.	How often do you feel the need for more instruction in other topics? (Please specify the topics on the back of the response sheet)

APPENDIX C

TASK PERFORMANCE FREQUENCY BY RESPONDENT GROUP

Tables 11 and 12 present the rank-ordered tasks for each respondent group, for Present (Table 11) and Projected (Table 12) task performance.

In each instance the tasks are ranked from 1 to 273 in descending order of performance frequency. Each respondent group is represented by two columns of figures. The first column refers to the task statement number, as presented in Table 10. The second column presents the Mean Performance Frequency for that task, as indicated by the respondent group.

TABLE 11

Rank Order of Task Performance (Present)

RANK	RESIDENTIAL		COMMERCIAL		BUSINESS AND OFFICE		INDUSTRIAL		AGRIBUSINESS	
1	262	4.79	1	4.41	262	4.93	257	4.44	257	4.50
2	6	4.68	6	4.26	18	4.74	259	4.39	259	4.39
3	261	4.65	262	4.22	259	4.68	265	4.25	265	4.32
4	259	4.59	18	4.22	16	4.58	262	4.19	258	4.29
5	238	4.47	265	4.07	248	4.55	5	4.17	263	4.18
6	41	4.47	248	4.00	261	4.35	1	4.14	262	4.18
7	18	4.47	20	4.00	6	4.35	2	4.11	1	4.11
8	40	4.38	2	4.00	238	4.26	18	4.00	248	4.07
9	248	4.35	5	3.96	247	4.23	6	4.00	264	4.04
10	39	4.35	259	3.89	217	4.19	258	3.97	261	3.96
11	217	4.29	257	3.74	20	4.19	261	3.94	18	3.93
12	20	4.29	217	3.70	1	4.16	263	3.92	5	3.93
13	5	4.26	258	3.67	23	4.10	3	3.89	6	3.82
14	1	4.26	261	3.63	2	4.10	264	3.83	266	3.79
15	19	4.21	249	3.63	254	4.06	20	3.67	20	3.75
16	2	4.21	16	3.63	19	4.03	39	3.66	253	3.68
17	43	4.06	254	3.59	257	4.00	272	3.53	256	3.64
18	42	4.06	101	3.59	39	4.00	255	3.53	249	3.61
19	216	3.94	19	3.59	7	3.97	256	3.50	247	3.54
20	28	3.91	247	3.56	216	3.93	55	3.47	19	3.54
21	263	3.88	266	3.55	5	3.93	217	3.44	28	3.46
22	264	3.82	39	3.52	260	3.84	54	3.42	254	3.43
23	260	3.82	263	3.48	17	3.81	15	3.42	250	3.43
24	266	3.79	238	3.48	41	3.77	266	3.39	3	3.43
25	101	3.76	250	3.44	28	3.71	260	3.36	225	3.36
26	16	3.71	264	3.37	3	3.71	17	3.25	23	3.36
27	254	3.70	89	3.37	218	3.68	248	3.22	255	3.32
28	7	3.70	218	3.33	40	3.68	218	3.17	15	3.32
29	247	3.68	7	3.33	256	3.64	23	3.17	16	3.29
30	250	3.62	256	3.30	226	3.64	253	3.08	7	3.29
31	237	3.56	239	3.30	263	3.61	254	3.06	268	3.25
32	257	3.53	233	3.30	233	3.61	28	3.06	226	3.25
33	218	3.53	225	3.26	229	3.61	267	3.03	2	3.25
34	44	3.51	240	3.22	258	3.58	19	3.03	217	3.21
35	265	3.50	226	3.22	33	3.48	241	3.00	39	3.21
36	258	3.50	260	3.18	264	3.45	59	2.97	24	3.18
37	256	3.50	106	3.18	31	3.45	233	2.94	241	3.14
38	255	3.50	241	3.15	199	3.39	240	2.89	267	3.11
39	89	3.50	28	3.15	235	3.32	89	2.83	260	3.11
40	272	3.47	23	3.15	101	3.32	24	2.81	227	3.07

Rank Order of Task Performance (Present) Continued

RANK	RESIDENTIAL		COMMERCIAL		BUSINESS AND OFFICE		INDUSTRIAL		AGRIBUSINESS	
41	249	3.44	15	3.15	15	3.32	14	2.78	228	3.04
42	232	3.38	230	3.11	54	3.29	11	2.78	272	3.00
43	24	3.35	235	3.07	38	3.29	230	2.75	229	3.00
44	233	3.29	229	3.07	24	3.29	21	2.75	224	3.00
45	226	3.29	219	3.07	239	3.26	247	2.72	245	2.93
46	229	3.27	85	3.07	202	3.26	271	2.69	230	2.93
47	224	3.21	83	3.07	265	3.23	239	2.67	240	2.89
48	85	3.18	55	3.07	255	3.23	114	2.67	113	2.89
49	225	3.15	17	3.07	228	3.23	229	2.64	233	2.86
50	57	3.12	3	3.04	225	3.23	16	2.64	242	2.82
51	56	3.12	232	3.04	191	3.23	7	2.64	21	2.79
52	230	3.09	54	3.04	44	3.23	249	2.61	17	2.79
53	227	3.09	11	3.04	266	3.19	101	2.61	191	2.75
54	114	3.09	237	3.00	250	3.19	9	2.61	198	2.71
55	253	3.06	224	3.00	237	3.19	268	2.58	239	2.68
56	23	3.06	41	3.00	30	3.19	242	2.58	231	2.68
57	219	3.03	272	2.96	272	3.10	234	2.58	218	2.68
58	11	3.03	84	2.96	249	3.10	115	2.58	89	2.68
59	15	3.03	231	2.93	219	3.06	83	2.56	31	2.68
60	103	2.94	216	2.93	43	3.06	113	2.53	14	2.68
61	9	2.94	40	2.93	234	3.00	245	2.50	10	2.68
62	239	2.91	24	2.93	29	3.00	224	2.50	216	2.64
63	235	2.91	253	2.89	231	2.97	85	2.50	235	2.61
64	95	2.91	103	2.85	198	2.97	56	2.50	213	2.61
65	54	2.91	90	2.85	188	2.97	27	2.50	85	2.57
66	240	2.88	21	2.85	240	2.93	8	2.50	83	2.57
67	90	2.88	268	2.81	230	2.93	273	2.47	252	2.54
68	32	2.88	246	2.81	10	2.93	243	2.47	101	2.54
69	246	2.79	96	2.81	140	2.90	111	2.47	32	2.54
70	93	2.79	267	2.78	55	2.90	4	2.47	246	2.50
71	83	2.79	234	2.78	227	2.87	84	2.44	243	2.50
72	228	2.76	228	2.78	189	2.84	235	2.42	12	2.50
73	100	2.76	59	2.78	35	2.84	191	2.42	11	2.50
74	84	2.76	97	2.74	42	2.81	116	2.42	251	2.46
75	55	2.76	86	2.74	271	2.77	32	2.42	79	2.43
76	106	2.73	114	2.70	253	2.77	22	2.42	44	2.43
77	251	2.71	87	2.70	241	2.74	209	2.39	25	2.43
78	241	2.71	9	2.70	126	2.71	26	2.39	22	2.43
79	271	2.68	10	2.69	89	2.71	216	2.36	244	2.39
80	59	2.68	271	2.67	59	2.68	97	2.36	103	2.39

Rank Order of Task Performance (Present) Continued

RANK	RESIDENTIAL		COMMERCIAL		BUSINESS AND OFFICE		INDUSTRIAL		AGRIBUSINESS	
81	267	2.65	245	2.67	34	2.68	231	2.33	59	2.39
82	10	2.65	43	2.67	22	2.68	79	2.33	33	2.39
83	268	2.62	244	2.63	174	2.61	33	2.33	108	2.36
84	21	2.59	42	2.63	267	2.45	13	2.33	90	2.36
85	94	2.56	32	2.63	133	2.45	12	2.33	4	2.36
86	87	2.56	255	2.59	125	2.45	250	2.31	273	2.32
87	22	2.53	227	2.59	113	2.45	214	2.31	106	2.32
88	12	2.53	95	2.59	8	2.45	198	2.31	9	2.32
89	245	2.50	251	2.56	11	2.43	112	2.31	271	2.29
90	234	2.50	242	2.56	268	2.39	103	2.31	238	2.29
91	17	2.44	107	2.56	251	2.39	25	2.31	84	2.29
92	231	2.41	22	2.55	236	2.39	10	2.31	27	2.29
93	102	2.41	243	2.52	134	2.35	226	2.28	8	2.29
94	14	2.41	12	2.52	245	2.32	106	2.28	55	2.25
95	3	2.41	252	2.46	242	2.32	53	2.28	26	2.25
96	115	2.38	27	2.44	224	2.32	45	2.28	269	2.18
97	113	2.35	100	2.37	183	2.32	222	2.25	222	2.14
98	92	2.35	102	2.30	128	2.32	213	2.22	114	2.14
99	252	2.33	98	2.30	114	2.29	182	2.22	87	2.14
100	105	2.33	4	2.28	232	2.26	36	2.20	54	2.14
101	116	2.32	94	2.26	201	2.26	96	2.19	234	2.11
102	98	2.32	33	2.26	246	2.23	90	2.17	209	2.11
103	86	2.32	31	2.26	181	2.23	87	2.14	115	2.11
104		2.26	8	2.26	157	2.23	86	2.14	236	2.07
105		2.26	91	2.23	103	2.23	246	2.11	207	2.07
106	273	2.24	236	2.22	182	2.19	236	2.11	86	2.07
107	104	2.23	105	2.22	135	2.19	219	2.11	41	2.07
108	56	2.21	191	2.18	56	2.19	164	2.11	232	2.00
109	243	2.18	221	2.15	14	2.19	31	2.11	220	2.00
110	13	2.18	93	2.15	9	2.19	238	2.06	219	2.00
111	4	2.18	222	2.11	36	2.17	174	2.06	199	2.00
112	244	2.15	108	2.11	170	2.16	157	2.06	88	2.00
113	31	2.09	116	2.07	155	2.16	92	2.06	193	1.96
114	91	2.06	115	2.07	139	2.16	88	2.06	116	1.96
115	222	2.03	44	2.07	129	2.16	269	2.03	43	1.96
116	86	1.97	206	2.04	117	2.16	232	2.03	40	1.93
117	107	1.94	104	2.04	243	2.10	212	2.03	237	1.89
118	8	1.91	99	2.04	205	2.03	207	2.03	56	1.89
119	236	1.88	56	2.04	137	2.00	159	2.03	34	1.89
120	125	1.87	92	2.00	13	2.00	158	2.03	214	1.86

Rank Order of Task Performance (Present) Continued

RANK	RESIDENTIAL		COMMERCIAL		BUSINESS AND OFFICE		INDUSTRIAL		AGRIBUSINESS	
121	156	1.85	88	2.00	138	1.93	139	2.03	206	1.82
122	157	1.85	35	1.96	122	1.93	91	2.03	164	1.82
123	140	1.85	14	1.96	118	1.93	35	2.03	104	1.82
124	269	1.82	139	1.93	171	1.90	34	2.00	192	1.79
125	221	1.82	109	1.93	45	1.90	140	1.97	139	1.79
126	198	1.82	34	1.93	213	1.87	40	1.97	97	1.79
127	30	1.82	26	1.93	173	1.87	244	1.94	96	1.79
128	70	1.79	198	1.89	158	1.87	220	1.94	92	1.79
129	220	1.73	13	1.89	123	1.87	181	1.94	210	1.75
130	191	1.73	140	1.85	121	1.87	102	1.94	200	1.75
131	27	1.73	25	1.85	37	1.87	227	1.92	102	1.75
132	215	1.71	79	1.85	203	1.84	183	1.92	42	1.75
133	99	1.71	269	1.81	159	1.84	58	1.92	35	1.75
134	33	1.71	204	1.81	21	1.84	38	1.92	91	1.71
135	29	1.71	202	1.81	200	1.81	210	1.89	80	1.71
136	199	1.68	36	1.81	160	1.81	109	1.89	223	1.68
137	111	1.68	181	1.78	115	1.81	80	1.89	194	1.68
138	108	1.68	220	1.74	12	1.81	29	1.89	159	1.68
139	188	1.65	113	1.74	252	1.77	202	1.86	98	1.68
140	181	1.65	110	1.74	154	1.77	107	1.86	95	1.68
141	164	1.65	45	1.74	116	1.77	99	1.86	29	1.68
142	158	1.65	38	1.70	46	1.77	70	1.86	111	1.64
143	139	1.65	29	1.70	53	1.77	57	1.86	93	1.64
144	126	1.65	199	1.67	132	1.74	228	1.83	38	1.64
145	45	1.65	174	1.67	102	1.74	225	1.83	36	1.64
146	174	1.62	155	1.67	244	1.71	201	1.81	197	1.63
147	110	1.62	46	1.67	79	1.71	46	1.81	270	1.61
148	109	1.62	30	1.65	222	1.68	37	1.81	202	1.61
149	36	1.62	213	1.63	221	1.68	30	1.81	109	1.61
150	112	1.59	111	1.63	206	1.68	125	1.79	30	1.61
151	79	1.59	53	1.63	136	1.68	221	1.78	208	1.59
152	58	1.59	37	1.63	131	1.68	203	1.78	158	1.57
153	214	1.56	183	1.59	172	1.64	197	1.78	107	1.57
154	170	1.56	205	1.56	90	1.64	108	1.78	221	1.54
155	160	1.56	154	1.56	74	1.64	237	1.75	201	1.54
156	134	1.56	69	1.56	220	1.61	133	1.75	196	1.54
157	133	1.56	201	1.52	204	1.61	98	1.75	183	1.54
158	26	1.56	189	1.52	164	1.61	49	1.75	112	1.54
159	171	1.53	159	1.52	87	1.61	223	1.72	69	1.54
160	34	1.53	157	1.52	26	1.61	252	1.69	45	1.54

Rank Order of Task Performance (Present) Continued

RANK	RESIDENTIAL		COMMERCIAL		BUSINESS AND OFFICE		INDUSTRIAL		AGRIBUSINESS	
161	223	1.50	182	1.52	190	1.58	199	1.69	174	1.52
162	207	1.50	188	1.48	180	1.58	170	1.69	195	1.50
163	189	1.50	158	1.48	141	1.58	165	1.69	110	1.50
164	177	1.50	141	1.48	70	1.58	126	1.69	99	1.50
165	176	1.50	58	1.48	185	1.55	193	1.67	58	1.50
166	122	1.50	223	1.44	25	1.55	192	1.67	53	1.46
167	213	1.47	126	1.44	273	1.52	135	1.67	37	1.46
168	173	1.47	164	1.41	209	1.52	134	1.67	13	1.46
169	123	1.47	71	1.41	119	1.52	95	1.67	126	1.44
170	175	1.44	70	1.38	85	1.52	196	1.64	205	1.43
171	161	1.44	125	1.36	186	1.48	171	1.64	203	1.43
172	145	1.44	273	1.33	130	1.48	160	1.64	189	1.43
173	141	1.44	193	1.33	49	1.48	136	1.64	166	1.43
174	132	1.44	112	1.33	27	1.48	74	1.64	165	1.43
175	180	1.41	51	1.33	269	1.45	72	1.64	155	1.43
176	138	1.41	207	1.30	144	1.45	50	1.64	140	1.43
177	137	1.41	200	1.30	175	1.42	208	1.61	94	1.43
178	46	1.41	173	1.30	163	1.42	200	1.61	70	1.43
179	35	1.41	82	1.30	176	1.39	166	1.61	212	1.39
180	72	1.41	72	1.30	4	1.37	117	1.61	204	1.39
181	210	1.38	48	1.30	193	1.35	104	1.61	181	1.39
182	209	1.38	47	1.30	166	1.35	251	1.60	160	1.39
183	166	1.38	57	1.27	111	1.35	194	1.58	105	1.39
184	165	1.38	270	1.26	107	1.35	186	1.58	57	1.39
185	25	1.38	209	1.26	106	1.35	121	1.58	188	1.36
186	206	1.35	190	1.26	51	1.35	93	1.58	182	1.36
187	183	1.35	186	1.26	50	1.35	69	1.58	170	1.36
188	182	1.35	185	1.26	47	1.35	47	1.58	169	1.36
189	168	1.35	165	1.26	92	1.33	175	1.57	157	1.36
190	135	1.35	145	1.26	197	1.32	188	1.56	144	1.36
191	73	1.35	117	1.26	168	1.32	185	1.56	117	1.36
192	49	1.35	49	1.26	165	1.32	161	1.56	82	1.36
193	172	1.33	214	1.22	96	1.32	51	1.56	72	1.36
194	169	1.32	203	1.22	60	1.32	44	1.56	186	1.32
195	142	1.32	192	1.22	210	1.29	173	1.53	180	1.32
196	127	1.32	180	1.22	161	1.29	128	1.53	171	1.32
197	69	1.32	177	1.22	127	1.29	118	1.53	168	1.32
198	57	1.32	162	1.22	97	1.29	100	1.53	167	1.32
199	50	1.32	160	1.22	84	1.29	167	1.50	162	1.32
200	152	1.29	144	1.22	58	1.29	129	1.50	161	1.32

Rank Order of Task Performance (Present) Continued

RANK	RESIDENTIAL		COMMERCIAL		BUSINESS AND OFFICE		INDUSTRIAL		AGRIBUSINESS	
201	155	1.29	143	1.22	270	1.26	122	1.50	118	1.32
202	47	1.29	122	1.19	196	1.26	105	1.50	73	1.32
203	37	1.29	210	1.18	99	1.26	71	1.50	71	1.32
204	270	1.26	176	1.18	86	1.26	60	1.50	190	1.29
205	190	1.26	175	1.18	80	1.26	189	1.47	173	1.29
206	178	1.26	167	1.18	61	1.26	141	1.47	100	1.29
207	136	1.26	156	1.18	48	1.26	206	1.44	62	1.29
208	80	1.26	153	1.18	194	1.23	205	1.44	46	1.29
209	208	1.23	152	1.18	177	1.23	137	1.44	211	1.25
210	163	1.23	151	1.18	169	1.23	73	1.44	185	1.25
211	121	1.23	147	1.18	167	1.23	41	1.44	179	1.25
212	117	1.23	130	1.18	152	1.23	270	1.42	141	1.25
213	71	1.23	123	1.18	104	1.23	176	1.42	125	1.25
214	64	1.23	73	1.18	98	1.23	155	1.42	67	1.25
215	167	1.21	50	1.18	83	1.23	110	1.42	60	1.25
216	144	1.21	215	1.15	77	1.23	94	1.42	175	1.21
217	119	1.21	194	1.15	76	1.23	81	1.42	163	1.21
218	118	1.21	166	1.15	32	1.23	215	1.39	74	1.21
219	48	1.21	163	1.15	207	1.19	168	1.39	68	1.21
220	200	1.18	161	1.15	162	1.19	138	1.39	61	1.21
221	195	1.18	131	1.15	105	1.19	61	1.39	187	1.18
222	186	1.18	129	1.15	71	1.19	42	1.39	184	1.18
223	185	1.18	127	1.15	69	1.19	204	1.36	177	1.18
224	130	1.18	80	1.11	64	1.19	52	1.36	176	1.18
225	128	1.18	179	1.11	223	1.16	48	1.36	172	1.18
226	82	1.18	170	1.11	142	1.16	195	1.33	132	1.18
227	74	1.18	168	1.11	75	1.16	177	1.33	78	1.18
228	38	1.18	149	1.11	73	1.16	172	1.33	63	1.18
229	211	1.15	138	1.11	72	1.16	169	1.33	48	1.18
230	197	1.15	128	1.11	62	1.16	162	1.33	156	1.14
231	194	1.15	118	1.11	184	1.13	144	1.33	142	1.14
232	187	1.15	208	1.07	178	1.13	124	1.33	123	1.14
233	184	1.15	197	1.07	149	1.13	82	1.33	77	1.14
234	179	1.15	187	1.07	112	1.13	76	1.33	76	1.14
235	147	1.15	184	1.07	110	1.13	43	1.33	75	1.14
236	146	1.15	178	1.07	109	1.13	184	1.31	66	1.14
237	131	1.15	171	1.07	108	1.13	163	1.31	65	1.14
238	120	1.15	150	1.07	88	1.13	62	1.31	64	1.14
239	65	1.15	148	1.07	211	1.10	187	1.28	47	1.14
240	63	1.15	146	1.07	192	1.10	180	1.28	129	1.11

Rank Order of Task Performance (Present) Continued

RANK	RESIDENTIAL		COMMERCIAL		BUSINESS AND OFFICE		INDUSTRIAL		AGRIBUSINESS	
241	61	1.15	142	1.07	179	1.10	132	1.28	178	1.11
242	60	1.15	135	1.07	156	1.10	123	1.28	128	1.11
243	196	1.12	134	1.07	82	1.10	64	1.28	127	1.11
244	193	1.12	133	1.07	214	1.06	127	1.25	124	1.11
245	143	1.12	212	1.04	212	1.06	119	1.25	122	1.11
246	81	1.12	169	1.04	208	1.06	65	1.25	120	1.11
247	66	1.12	137	1.04	195	1.06	142	1.22	119	1.11
248	62	1.12	121	1.04	148	1.06	130	1.22	215	1.07
249	52	1.12	119	1.04	146	1.06	120	1.22	145	1.07
250	51	1.12	75	1.04	124	1.06	63	1.22	143	1.07
251	212	1.09	74	1.04	120	1.06	178	1.19	135	1.07
252	205	1.09	67	1.04	95	1.06	146	1.19	134	1.07
253	204	1.09	211	1.00	78	1.06	78	1.19	133	1.07
254	203	1.09	196	1.00	65	1.06	66	1.19	131	1.07
255	202	1.09	195	1.00	153	1.03	190	1.17	130	1.07
256	201	1.09	172	1.00	150	1.03	156	1.17	52	1.07
257	156	1.09	136	1.00	143	1.03	143	1.17	51	1.07
258	154	1.09	132	1.00	67	1.03	131	1.17	50	1.07
259	129	1.09	124	1.00	63	1.03	77	1.17	49	1.07
260	124	1.09	120	1.00	57	1.03	211	1.14	154	1.04
261	75	1.09	81	1.00	52	1.03	149	1.14	152	1.04
262	192	1.06	78	1.00	215	1.00	148	1.11	146	1.[illegible]
263	152	1.06	77	1.00	187	1.00	147	1.11	121	1.[illegible]
264	151	1.06	76	1.00	151	1.00	145	1.11	153	1.00
265	150	1.06	68	1.00	147	1.00	75	1.11	151	1.00
266	149	1.06	66	1.00	145	1.00	67	1.11	150	1.00
267	148	1.06	65	1.00	100	1.00	179	1.08	149	1.00
268	153	1.03	64	1.00	94	1.00	154	1.06	148	1.00
269	67	1.03	63	1.00	93	1.00	152	1.03	147	1.00
270	78	1.00	62	1.00	91	1.00	151	1.03	138	1.00
271	77	1.00	61	1.00	81	1.00	68	1.03	137	1.00
272	76	1.00	60	1.00	68	1.00	153	1.00	136	1.00
273	68	1.00	52	1.00	66	1.00	150	1.00	81	1.00

TABLE 12

Rank Order of Task Performance (Projected)

RANK	RESIDENTIAL		COMMERCIAL		BUSINESS/PROFESSIONAL OFFICE		INDUSTRIAL		AGRIBUSINESS	
1	262	4.81	1	4.69	262	4.93	265	4.56	257	4.57
2	6	4.76	6	4.42	259	4.77	257	4.56	259	4.44
3	261	4.68	2	4.38	18	4.74	259	4.44	258	4.43
4	259	4.65	262	4.37	248	4.68	258	4.44	265	4.36
5	41	4.56	18	4.31	16	4.61	262	4.36	1	4.36
6	40	4.56	5	4.27	1	4.48	5	4.36	263	4.29
7	18	4.56	20	4.23	238	4.39	2	4.33	262	4.25
8	248	4.50	265	4.15	6	4.39	1	4.31	248	4.18
9	39	4.50	259	4.07	261	4.36	18	4.19	5	4.14
10	238	4.47	248	4.07	217	4.32	3	4.17	264	4.07
11	20	4.44	217	3.89	20	4.29	263	4.11	20	4.07
12	5	4.32	257	3.81	19	4.29	6	4.11	261	4.04
13	2	4.32	249	3.81	254	4.26	264	4.06	18	4.00
14	217	4.29	254	3.78	247	4.23	261	4.03	6	4.00
15	1	4.29	16	3.73	2	4.23	39	4.00	19	3.89
16	19	4.26	261	3.70	257	4.13	20	3.97	266	3.82
17	43	4.06	258	3.70	39	4.10	217	3.78	253	3.82
18	42	4.06	247	3.70	23	4.10	266	3.67	3	3.82
19	216	4.03	39	3.70	5	4.06	256	3.64	2	3.75
20	28	3.94	19	3.69	216	4.03	55	3.64	256	3.68
21	266	3.91	101	3.67	7	3.93	54	3.64	249	3.68
22	16	3.91	266	3.63	258	3.90	15	3.58	7	3.68
23	263	3.85	250	3.59	17	3.90	248	3.50	23	3.64
24	250	3.85	238	3.56	54	3.81	272	3.47	28	3.61
25	264	3.82	218	3.52	218	3.77	218	3.47	16	3.61
26	247	3.82	17	3.50	263	3.74	255	3.44	254	3.57
27	265	3.79	263	3.48	260	3.74	17	3.42	247	3.57
28	260	3.79	89	3.48	40	3.74	23	3.36	15	3.54
29	254	3.79	264	3.41	226	3.71	254	3.33	268	3.46
30	101	3.76	239	3.41	233	3.68	19	3.31	250	3.46
31	7	3.76	225	3.41	41	3.68	267	3.28	39	3.39
32	249	3.71	15	3.38	3	3.68	253	3.28	255	3.36
33	257	3.68	7	3.38	256	3.64	16	3.28	217	3.36
34	258	3.67	233	3.37	229	3.64	59	3.22	24	3.32
35	237	3.65	3	3.36	140	3.61	28	3.19	241	3.29
36	89	3.65	21	3.35	28	3.61	260	3.17	225	3.25
37	272	3.62	241	3.33	250	3.55	241	3.14	267	3.21
38	256	3.62	240	3.33	235	3.55	240	3.14	113	3.18
39	255	3.62	226	3.33	239	3.52	249	3.11	21	3.18
40	218	3.62	23	3.31	33	3.52	21	3.11	224	3.14

Rank Order of Task Performance (Projected) Continued

RANK	RESIDENTIAL		COMMERCIAL		BUSINESS AND OFFICE		INDUSTRIAL		AGRIBUSINESS	
41	44	3.58	256	3.30	264	3.48	247	3.08	229	3.11
42	232	3.47	229	3.30	15	3.48	89	3.08	226	3.11
43	24	3.47	106	3.30	255	3.45	14	3.03	260	3.07
44	224	3.41	216	3.26	101	3.45	233	3.02	240	3.07
45	233	3.38	85	3.26	199	3.42	268	3.00	17	3.07
46	228	3.38	28	3.23	264	3.39	230	2.97	272	3.04
47	229	3.38	230	3.22	243	3.39	239	2.94	230	3.04
48	96	3.35	40	3.22	232	3.39	216	2.94	10	3.04
49	85	3.35	260	3.18	44	3.39	24	2.94	245	3.00
50	57	3.29	219	3.18	31	3.35	271	2.92	227	3.00
51	15	3.29	90	3.18	24	3.35	11	2.92	233	2.96
52	11	3.26	83	3.18	237	3.32	242	2.89	218	2.96
53	230	3.23	55	3.18	228	3.32	101	2.89	32	2.96
54	219	3.23	235	3.15	225	3.32	9	2.89	242	2.93
55	253	3.21	84	3.15	240	3.26	234	2.86	198	2.93
56	90	3.21	24	3.11	234	3.26	114	2.83	228	2.89
57	225	3.18	224	3.11	272	3.23	85	2.83	191	2.89
58	114	3.18	96	3.11	38	3.23	245	2.78	31	2.89
59	227	3.15	54	3.11	219	3.19	229	2.78	12	2.89
60	23	3.15	41	3.11	202	3.19	250	2.75	216	2.86
61	240	3.12	11	3.08	191	3.19	113	2.[illegible]	11	2.86
62	95	3.12	237	3.07	55	3.19	83	2.[illegible]	231	2.82
63	239	3.06	272	3.04	266	3.16	13	2.75	83	2.82
64	93	3.03	232	3.00	231	3.16	8	2.75	235	2.79
65	9	3.03	268	2.96	227	3.13	209	2.72	85	2.79
66	246	3.00	234	2.93	43	3.13	115	2.72	14	2.79
67	103	3.00	231	2.93	133	3.10	4	2.72	235	2.75
68	100	3.00	103	2.93	198	3.06	224	2.69	89	2.75
69	54	3.00	267	2.89	174	3.06	56	2.69	101	2.71
70	32	3.00	253	2.89	241	3.03	103	2.67	26	2.71
71	241	2.97	246	2.89	134	3.03	27	2.67	4	2.71
72	235	2.94	228	2.89	30	3.03	7	2.67	252	2.68
73	268	2.91	97	2.89	29	3.03	84	2.64	246	2.68
74	251	2.91	87	2.89	251	3.00	26	2.64	25	2.68
75	83	2.91	86	2.89	230	3.00	273	2.61	213	2.64
76	228	2.88	252	2.88	126	2.93	243	2.61	59	2.64
77	21	2.86	12	2.85	89	2.93	235	2.61	55	2.61
78	106	2.85	227	2.81	10	2.93	222	2.61	33	2.61
79	84	2.83	53	2.81	253	2.90	214	2.61	8	2.61
80	59	2.82	32	2.81	188	2.90	22	2.61	251	2.57

Rank Order of Task Performance (Projected) Continued

RANK	RESIDENTIAL		COMMERCIAL		BUSINESS AND OFFICE		INDUSTRIAL		AGRIBUSINESS	
81	271	2.79	271	2.78	135	2.90	32	2.58	108	2.57
82	267	2.79	255	2.78	59	2.90	10	2.58	103	2.57
83	55	2.79	251	2.78	271	2.84	191	2.56	84	2.57
84	245	2.76	245	2.78	129	2.81	45	2.56	27	2.57
85	87	2.73	95	2.78	189	2.77	25	2.56	22	2.57
86	94	2.71	10	2.76	128	2.77	12	2.56	9	2.57
87	12	2.71	244	2.74	125	2.77	116	2.53	243	2.54
88	10	2.68	242	2.74	42	2.77	79	2.53	90	2.54
89	17	2.65	9	2.73	34	2.77	111	2.50	54	2.54
90	22	2.62	114	2.70	267	2.68	97	2.50	44	2.54
91	104	2.59	43	2.70	236	2.68	86	2.47	106	2.50
92	92	2.59	42	2.70	113	2.68	182	2.44	244	2.46
93	3	2.59	243	2.67	268	2.61	53	2.44	273	2.43
94	115	2.56	107	2.63	242	2.61	246	2.42	115	2.43
95	113	2.56	22	2.61	157	2.61	198	2.42	87	2.43
96	252	2.54	27	2.58	56	2.61	33	2.42	79	2.43
97	234	2.53	102	2.52	245	2.58	231	2.39	269	2.39
98	14	2.53	100	2.52	224	2.58	213	2.39	114	2.33
99	242	2.50	236	2.48	139	2.58	106	2.39	238	2.32
100	105	2.47	105	2.48	246	2.55	87	2.39	209	2.32
101	102	2.47	33	2.46	181	2.55	220	2.36	86	2.32
102	116	2.44	4	2.46	117	2.55	219	2.36	271	2.29
103	231	2.41	31	2.42	22	2.55	207	2.36	207	2.29
104	98	2.41	8	2.38	183	2.52	140	2.36	41	2.29
105	80	2.41	222	2.37	138	2.52	139	2.36	222	2.25
106	273	2.38	221	2.37	137	2.52	36	2.34	234	2.21
107	244	2.35	91	2.35	11	2.48	236	2.33	199	2.21
108	53	2.35	98	2.33	155	2.45	164	2.33	236	2.14
109	243	2.32	94	2.33	182	2.42	90	2.33	88	2.14
110	13	2.32	104	2.30	136	2.42	226	2.31	56	2.14
111	56	2.29	99	2.30	244	2.39	181	2.31	40	2.14
112	4	2.29	93	2.30	243	2.39	157	2.31	220	2.11
113	145	2.23	13	2.23	8	2.39	31	2.31	116	2.11
114	31	2.23	191	2.22	114	2.35	112	2.28	219	2.07
115	91	2.21	115	2.22	170	2.32	269	2.25	98	2.07
116	236	2.18	56	2.22	14	2.32	238	2.25	43	2.07
117	222	2.12	126	2.18	13	2.32	96	2.25	34	2.07
118	221	2.12	92	2.17	252	2.26	174	2.19	200	2.04
119	157	2.12	14	2.15	173	2.26	88	2.19	193	2.04
120	140	2.09	116	2.15	103	2.26	40	2.19	232	2.00

Rank Order of Task Performance (Projected) Continued

RANK	RESIDENTIAL		COMMERCIAL		BUSINESS AND OFFICE		INDUSTRIAL		AGRIBUSINESS	
121	107	2.09	108	2.15	122	2.23	35	2.19	192	2.00
122	125	2.06	140	2.11	118	2.23	29	2.19	139	2.00
123	88	2.06	34	2.06	4	2.23	227	2.17	237	1.96
124	269	2.03	25	2.08	36	2.20	212	2.17	214	1.96
125	159	2.03	206	2.07	205	2.19	183	2.17	210	1.96
126	6	2.03	139	2.07	201	2.19	158	2.17	159	1.96
127	220	2.00	88	2.07	158	2.19	34	2.17	97	1.96
128	158	1.97	35	2.04	131	2.19	159	2.14	92	1.96
129	126	1.97	44	2.04	45	2.16	244	2.11	29	1.96
130	70	1.88	109	2.00	141	2.13	102	2.11	164	1.93
131	45	1.88	220	1.96	53	2.10	92	2.11	206	1.89
132	139	1.85	113	1.96	171	2.10	58	2.09	104	1.89
133	30	1.85	26	1.96	121	2.10	232	2.08	102	1.89
134	215	1.82	36	1.96	35	2.09	126	2.08	96	1.89
135	158	1.79	202	1.93	132	2.03	91	2.08	91	1.89
136	27	1.79	29	1.92	46	2.03	125	2.06	38	1.89
137	199	1.76	269	1.89	37	2.03	210	2.06	194	1.86
138	191	1.76	198	1.89	160	2.00	133	2.06	35	1.86
139	181	1.76	45	1.89	159	2.00	99	2.06	30	1.86
140	111	1.76	181	1.81	123	2.00	251	2.03	158	1.82
141	99	1.76	155	1.81	21	2.00	80	2.03	42	1.82
142	29	1.76	141	1.81	115	1.97	74	2.03	13	1.82
143	174	1.73	110	1.81	154	1.93	38	2.03	80	1.79
144	164	1.73	79	1.81	203	1.90	252	2.00	36	1.79
145	160	1.73	199	1.78	130	1.90	221	2.00	197	1.78
146	110	1.73	174	1.78	74	1.87	134	2.00	126	1.78
147	108	1.73	46	1.78	49	1.87	109	2.00	270	1.75
148	33	1.73	38	1.77	222	1.84	70	2.00	223	1.75
149	188	1.71	125	1.76	221	1.84	57	2.00	202	1.75
150	134	1.71	159	1.74	206	1.84	49	2.00	111	1.75
151	109	1.71	157	1.74	200	1.84	46	2.00	107	1.75
152	133	1.68	127	1.74	176	1.84	228	1.97	95	1.75
153	112	1.68	30	1.72	164	1.84	203	1.97	93	1.75
154	36	1.68	213	1.70	116	1.84	202	1.97	206	1.74
155	223	1.65	119	1.70	50	1.84	165	1.97	112	1.71
156	214	1.65	37	1.69	213	1.81	108	1.97	99	1.71
157	176	1.65	223	1.67	79	1.81	98	1.97	174	1.70
158	122	1.65	158	1.67	12	1.81	44	1.97	221	1.68
159	58	1.65	111	1.67	180	1.77	201	1.94	201	1.68
160	171	1.62	69	1.63	172	1.77	170	1.94	110	1.68

Rank Order of Task Performance (Projected) Continued

RANK	RESIDENTIAL		COMMERCIAL		BUSINESS AND OFFICE		INDUSTRIAL		AGRIBUSINESS	
161	170	1.62	58	1.63	90	1.77	135	1.94	109	1.68
162	132	1.62	53	1.63	204	1.74	60	1.94	56	1.68
163	123	1.62	183	1.59	119	1.74	37	1.94	37	1.68
164	26	1.62	154	1.59	70	1.74	225	1.92	45	1.67
165	207	1.59	182	1.56	26	1.74	197	1.92	196	1.64
166	177	1.59	205	1.52	102	1.71	171	1.92	183	1.64
167	173	1.59	201	1.52	220	1.68	136	1.92	69	1.64
168	127	1.59	189	1.52	185	1.68	237	1.89	203	1.61
169	46	1.59	71	1.52	51	1.68	223	1.89	189	1.61
170	35	1.59	188	1.48	269	1.64	95	1.89	155	1.61
171	161	1.56	164	1.48	166	1.64	51	1.89	140	1.61
172	141	1.56	70	1.46	25	1.64	30	1.89	57	1.61
173	138	1.56	128	1.44	87	1.61	160	1.86	53	1.59
174	137	1.56	180	1.41	47	1.61	121	1.86	195	1.57
175	79	1.56	145	1.41	27	1.61	50	1.86	157	1.57
176	25	1.56	134	1.41	186	1.58	199	1.83	94	1.57
177	213	1.53	132	1.41	165	1.58	166	1.83	212	1.54
178	189	1.53	112	1.41	85	1.58	141	1.83	205	1.54
179	34	1.53	82	1.41	48	1.58	128	1.83	188	1.54
180	165	1.50	72	1.41	190	1.55	118	1.83	166	1.54
181	270	1.48	51	1.41	177	1.55	117	1.83	165	1.54
182	180	1.47	49	1.41	163	1.55	107	1.83	72	1.54
183	168	1.47	48	1.41	144	1.55	72	1.83	182	1.50
184	135	1.47	57	1.38	72	1.55	69	1.83	181	1.50
185	209	1.44	270	1.37	58	1.55	52	1.83	160	1.50
186	72	1.44	200	1.37	273	1.52	208	1.81	105	1.50
187	210	1.41	193	1.37	167	1.52	192	1.81	100	1.50
188	183	1.41	133	1.37	60	1.48	186	1.81	70	1.50
189	175	1.41	117	1.37	209	1.45	61	1.81	204	1.46
190	169	1.41	50	1.37	168	1.45	175	1.80	186	1.46
191	166	1.41	47	1.37	127	1.45	200	1.78	170	1.46
192	162	1.41	122	1.35	76	1.45	196	1.78	141	1.46
193	136	1.41	273	1.33	4	1.43	194	1.78	73	1.46
194	121	1.41	209	1.33	175	1.42	104	1.78	71	1.46
195	69	1.41	207	1.33	161	1.42	193	1.75	46	1.46
196	172	1.39	177	1.33	152	1.42	82	1.75	190	1.43
197	182	1.38	173	1.33	61	1.42	205	1.72	173	1.43
198	73	1.38	170	1.33	270	1.39	173	1.72	171	1.43
199	57	1.38	165	1.33	197	1.39	122	1.72	169	1.43
200	49	1.38	160	1.33	107	1.39	185	1.69	168	1.43

Rank Order of Task Performance (Projected) Continued

RANK	RESIDENTIAL		COMMERCIAL		BUSINESS AND OFFICE		INDUSTRIAL		AGRIBUSINESS	
201	37	1.38	152	1.33	96	1.39	167	1.69	167	1.43
202	206	1.35	147	1.33	75	1.39	161	1.69	161	1.43
203	155	1.35	144	1.33	73	1.39	129	1.69	144	1.43
204	142	1.35	142	1.33	69	1.39	47	1.69	118	1.43
205	124	1.35	214	1.30	169	1.36	41	1.69	117	1.43
206	117	1.35	203	1.30	193	1.35	206	1.67	82	1.43
207	71	1.35	167	1.30	178	1.35	188	1.67	74	1.43
208	47	1.35	162	1.30	162	1.35	137	1.67	62	1.43
209	178	1.32	156	1.30	111	1.35	119	1.67	185	1.39
210	130	1.32	151	1.30	106	1.35	62	1.67	162	1.39
211	128	1.32	143	1.30	71	1.35	132	1.64	125	1.39
212	50	1.32	129	1.30	142	1.32	130	1.64	180	1.36
213	190	1.29	123	1.30	99	1.32	110	1.64	132	1.36
214	163	1.29	190	1.26	84	1.32	100	1.64	127	1.36
215	119	1.29	185	1.26	77	1.32	76	1.64	77	1.36
216	208	1.26	176	1.26	223	1.29	71	1.64	76	1.36
217	200	1.26	175	1.26	210	1.29	204	1.61	75	1.36
218	186	1.26	138	1.26	184	1.29	172	1.61	176	1.32
219	146	1.26	135	1.26	104	1.29	138	1.61	61	1.32
220	120	1.26	73	1.26	97	1.29	93	1.61	60	1.32
221	118	1.26	130	1.23	62	1.29	81	1.61	48	1.32
222	74	1.26	215	1.22	207	1.26	73	1.61	47	1.32
223	48	1.26	210	1.22	196	1.26	65	1.61	51	1.30
224	185	1.23	192	1.22	86	1.26	64	1.61	215	1.29
225	144	1.23	186	1.22	80	1.26	42	1.61	211	1.29
226	143	1.23	179	1.22	194	1.23	215	1.58	187	1.29
227	131	1.23	166	1.22	156	1.23	189	1.58	184	1.29
228	82	1.23	161	1.22	149	1.23	169	1.58	179	1.29
229	80	1.23	149	1.22	109	1.23	155	1.58	177	1.29
230	64	1.23	146	1.22	105	1.23	131	1.58	163	1.29
231	203	1.21	118	1.22	98	1.23	124	1.58	142	1.29
232	187	1.21	171	1.18	64	1.23	63	1.58	68	1.29
233	184	1.21	163	1.18	32	1.23	270	1.56	67	1.29
234	167	1.21	153	1.18	179	1.19	176	1.56	63	1.29
235	129	1.21	150	1.18	148	1.19	168	1.56	175	1.25
236	38	1.21	137	1.18	124	1.19	144	1.56	172	1.25
237	157	1.18	80	1.15	120	1.19	105	1.56	156	1.25
238	195	1.18	204	1.15	112	1.19	48	1.56	135	1.25
239	193	1.18	194	1.15	110	1.19	195	1.53	120	1.25
240	179	1.18	178	1.15	83	1.19	184	1.53	129	1.22

Rank Order of Task Performance (Projected) Continued

RANK	RESIDENTIAL		COMMERCIAL		BUSINESS AND OFFICE		INDUSTRIAL		AGRIBUSINESS	
241	147	1.18	168	1.15	63	1.19	120	1.53	128	1.22
242	65	1.18	148	1.15	146	1.16	94	1.53	50	1.22
243	60	1.18	136	1.15	143	1.16	66	1.53	134	1.21
244	52	1.18	131	1.15	108	1.16	43	1.53	133	1.21
245	211	1.15	61	1.15	88	1.16	187	1.50	131	1.21
246	205	1.15	60	1.15	67	1.16	127	1.50	123	1.21
247	204	1.15	212	1.11	57	1.16	123	1.50	78	1.21
248	196	1.15	74	1.11	92	1.13	180	1.47	49	1.21
249	194	1.15	208	1.07	192	1.13	177	1.47	52	1.18
250	192	1.15	197	1.07	187	1.13	77	1.44	130	1.18
251	153	1.15	187	1.07	153	1.13	162	1.42	119	1.18
252	81	1.15	184	1.07	82	1.13	75	1.42	66	1.18
253	75	1.15	169	1.07	78	1.13	163	1.39	65	1.18
254	66	1.15	124	1.07	65	1.13	146	1.39	178	1.14
255	63	1.15	121	1.07	52	1.13	143	1.39	143	1.14
256	62	1.15	75	1.07	212	1.10	142	1.39	136	1.14
257	61	1.15	62	1.07	211	1.10	78	1.39	124	1.14
258	51	1.15	120	1.04	208	1.10	190	1.36	122	1.14
259	212	1.12	78	1.04	195	1.10	178	1.33	121	1.14
260	154	1.12	77	1.04	95	1.10	147	1.33	64	1.14
261	77	1.12	76	1.04	66	1.10	148	1.31	145	1.11
262	202	1.09	67	1.04	214	1.06	145	1.31	137	1.11
263	201	1.09	63	1.04	147	1.06	68	1.31	138	1.07
264	156	1.09	211	1.00	145	1.06	211	1.28	154	1.07
265	149	1.09	196	1.00	81	1.06	156	1.28	152	1.07
266	148	1.09	195	1.00	68	1.06	67	1.28	147	1.07
267	152	1.06	172	1.00	151	1.03	179	1.22	146	1.07
268	151	1.06	81	1.00	150	1.03	153	1.17	153	1.04
269	150	1.06	68	1.00	215	1.00	149	1.17	151	1.04
270	76	1.06	66	1.00	100	1.00	154	1.14	150	1.04
271	67	1.06	65	1.00	94	1.00	151	1.14	149	1.04
272	78	1.03	64	1.00	93	1.00	152	1.11	148	1.04
273	68	1.03	52	1.00	91	1.00	150	1.11	81	1.00